FINDING OF NO SIGNIFICANT IMPACT

CHERRY CREEK LAKE PROJECT
1991 MASTER PLAN UPDATE, D.M. CC-14

The Corps of Engineers proposes to approve an updated Master Plan for the Cherry Creek Lake Project in the vicinity of Denver, Colorado. The Master Plan would accommodate moderate increases in visitation by allowing for upgrading of existing recreation facilities, and construction of new facilities principally near existing facilities and around the perimeter of the lake. An environmental assessment has been conducted and is incorporated by reference herein.

The environmental assessment has been used to determine whether the action requires the preparation of an Environmental Impact Statement. Negative effects identified for this action were deemed minor, including loss of some grassland and open space for new recreation facilities, and minor increase in displacement and disturbance of wildlife. No significant impacts were identified.

Factors that were considered in making this decision included, but were not necessarily limited to, conservation, economics, esthetics, general environmental concerns, historic values, fish and wildlife values, flood damage prevention, land use classification, navigation, recreation, water supply, water quality, energy needs, safety, food production, and in general the needs and welfare of the people.

It is my finding that the proposed Federal action will not have a significant adverse effect on the environment and that the action will not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, an Environmental Impact Statement will not be prepared.

DATE: 29 April 1991

Stewart H. Bornhoft

STEWART H. BORNHOFT
Colonel, Corps of Engineers
District Engineer

ENVIRONMENTAL ASSESSMENT

CHERRY CREEK LAKE MASTER PLAN

OMAHA DISTRICT CORPS OF ENGINEERS

MARCH 1991

ENVIRONMENTAL ASSESSMENT
CHERRY CREEK LAKE MASTER PLAN

THE PROPOSED PROJECT

1. Location.

State: Colorado County: Arapahoe
Reservoir: Cherry Creek Dam: Cherry Creek
Nearest towns: Denver, suburbs

2. Problem and Project Description.

a. **Problem.**

The existing Master Plan documents for Cherry Creek Reservoir Project are nearly 20 years old. They provide an inadequate basis on which to judge contemporary proposals. Soaring demand for recreation and non-recreation use at the project, and problems from the surrounding urbanization, have emphasized the need to update the Master Plan to guide project development and use in the future. The special character of the project, derived from its natural undeveloped condition within the metropolitan setting, needs to be protected.

b. **Project description.**

The proposed action is a revised Master Plan which accommodates existing recreation and provides for increased recreation, while preserving most of the project in undeveloped open space. The new Master Plan as proposed would add trail facilities, picnic shelters, handicapped fishing access, sprinkler systems, comfort stations, a playground, ranger buildings, shoreline erosion protection, utility lines, potable water, road paving, and other features, mostly at or adjacent to existing recreation areas, to upgrade and expand recreation resources. But it would concentrate activities near existing developments to minimize encroachment on the open spaces. And low density recreation would be the main objective of most of the project's open space.

FUTURE AFFECTED ENVIRONMENT

1. General.

The future affected environment will be the result of the impact of past, present and reasonably foreseeable future actions, without the proposed action.

Prehistorically, project lands were short-grass prairie with deciduous woody growth in the drainageways. Water was limited to the main stream channels. After human settlement, the project area was heavily used for agriculture. The city of Denver began growing up, and to provide flood control, Cherry Creek Dam was built upstream of downtown Denver about 40 years ago.

Today, Cherry Creek project is surrounded by urbanization

and a growing population. It is a heavily used recreation area, managed intensively by the State and three municipalities. Many recreation facilities have been built inside the project and around its perimeter, and many recreationists visit the site each day especially during summer. However, the Cherry Creek project is also managed to protect wildlife, and it remains an island of habitat in the midst of the Denver metropolis.

The future is expected to provide a continuation of some current trends. It is expected that population and recreation demand will continue to grow. Urbanization will further isolate the project lands' wildlife, and will lead to further on-site erosion and pollution concerns. Under continuation of the current Master Plan, on-site natural resources would be somewhat preserved from urbanization by the presence of the Federal project. But also within the existing Master Plan, a variety of new recreation developments could occur, with more recreation facilities, more trails and more visitation.

Demands for water for consumptive uses would also increase with the population. It is also possible in the future that major changes could occur, such as the addition of large volumes of water storage in the reservoir, but the likelihood of this is considered too uncertain to factor into this assessment.

So the future environment at the project with past, present, and reasonably foreseeable actions would promise to retain a relatively undeveloped nature, but would be somewhat degraded by increased pressure from surrounding urbanization, increased recreation, increased facility development, and increased demands on the water.

2. Terrestrial Habitat and Wildlife.

Most of the project lands are upland habitat dominated by grasses such as wheatgrasses, forbs such as yucca, shrubs such as rabbitbrush, and occasional trees. Project lands around the pool include the dam face, sandy beaches, steep banks with scattered cottonwood trees, occasional shallow bays, and the delta complex.

The delta complex is a large, diverse community which is growing and changing. The delta includes mudflats, low sandbars with willow shoots, wet depressions with cattails and reeds, and higher areas with willow thickets, trees, and tall grasses, lending much diversity to the habitat.

On both the west and east sides of the lake, most of the shores are heavily used by the public.

Many historically common species have been extirpated, but project lands remain a sort of refuge for some more tolerant or more tolerated species of wildlife. Habitat is more diverse than historically, because of the reservoir, the increased wetland areas, and manmade plantings. Management objectives of the State of Colorado's managing agency and the City of Aurora include

protection of the wildlife and its habitat. Hunting is not allowed.

Terrestrial wildlife frequenting the area include mule deer, coyotes, jack rabbits, pheasants, Canada geese, marsh hawks, great blue herons, long tailed weasels, bullsnakes, and a sizable prairie dog population. Wildlife especially found in the delta include furbearers, some waterfowl, occasional bald eagles in winter, various shorebirds and waders, gulls, screech owls, diverse songbirds, bats, and some reptiles and amphibians. Wildlife which especially use the shoreline areas include raccoons, gulls, shorebirds and waders, blackbirds, and some reptiles and amphibians. Wildlife which use the spillway area include waterfowl, songbirds, raccoon, and deer.

3. **Waterfowl and shorebirds.**

Currently, little use is made of the project by ducks. Canada geese have begun to make increasing use of the project, and the State considers them overpopulated at the project. Great blue herons use the dead cottonwood trees at the delta end of the lake. A variety of shorebirds, waders and gulls make occasional use of the lake surface and shorelines during migration.

4. **Fisheries and aquatics.**

Cherry Creek State Recreation Area is one of the most heavily used fisheries in the State of Colorado, especially for walleyes and trout. However, not all species are self-sustaining, because of the lack of good spawning habitat and the low dissolved oxygen levels. Viable catfish and panfish populations have developed. Walleye, muskie, trout and other species are stocked. Shad are self-sustaining and are the main forage for the sport fish. Minor spring fish kills of shad are common.

5. **Water Quality.**

The lake has a high nutrient content, a low dissolved oxygen content, and is eutrophic. Urbanization has increased sediment inflows as well as contaminant inflows in recent years. Algal blooms can be a problem. Deposited sediments in the delta area are often resuspended by wave action and are redistributed in the lake. Storm and flood events result in heavy run-off carrying large sediment loads which cause turbidity. Turbidity is considered a benefit in limiting algal blooms.

6. **Threatened and Endangered Species.**

The U.S. Fish and Wildlife Service (FWS) was consulted, and advises that protected species in the area could include the black-footed ferret, bald eagle, and peregrine falcon.

Bald eagles do visit the project for winter feeding and roosting, possibly seeking waterfowl and prairie dogs. The eagles mostly use the dead cottonwood trees in standing water in the southeast portion of the project. They probably prefer these

for the isolation from shore and the visibility. This eagle winter use is very casual, unpredictable, and sporadic, not winter-long.

Eagle presence in winter tends to coincide with low visitation levels, avoiding much conflict with users. It appears that spring and summer human visitation is far too active to accommodate eagle nesting, and may even be too active in February/March for eagles to try nesting in the area.

Peregrine falcons may pass through the area during migration. They may visit the project because of the potential presence of prey birds attracted by the project's water and vegetation. However, falcon presence is not common, and no suitable nesting or roosting conditions occur inside the project boundaries.

Black-footed ferrets are believed to have occurred in portions of the project area historically. Ferrets rely heavily on prairie dogs as prey, and prairie dogs do occur on the project. Any activities that would disturb prairie dog colonies may require black-footed ferret surveys. It is extremely unlikely that any ferrets occur in the project, given their rarity, the surrounding development, the relatively small size of the prairie dog towns, and the possibility that ferrets would have been seen by now. Neither the staff of the Department of Parks and Outdoor Recreation (DPOR) nor the public have sighted ferrets over many years of use, nor did the Division of Wildlife (DOW) when making its inventory of wildlife at the project.

The Ute ladies' tresses orchid is proposed by the FWS to be listed as a threatened species; the main known populations are in Colorado, but their presence on the project is unknown.

7. **Pests.**

Mosquitoes are found throughout the project, but are more of a problem in the spillway area because of the wetlands there and the proximity of residential dwellings. They also breed abundantly in the delta area, but these are not near residential housing or heavy recreation areas. Prairie dogs sometimes cause problems.

8. **Erosion.**

Areas with historically severe erosion have been protected with riprap, especially near recreation facilities. Losses to property and resources have been minor. Approximately 30% of the shoreline is currently undergoing minor erosion. Shoreline erosion has affected water quality by adding nutrients and adding to turbidity.

9. **Recreation.**

a. **General.** Due to the metropolitan setting, Cherry Creek receives over 1 million visitor days of use per year, and use demand will increase. Though recreation occurs year-round, it is concentrated in summer.

Traditionally major uses have been fishing, picnicking, sightseeing, swimming and boating. Increasingly, walking, jogging and bicycling are accounting for many visitor days, as are windsurfing and jet skiing.

b. **Scenic viewing.** Sightseeing is the primary activity for over 10% of recorded visitation, and is a supporting factor for other uses. The appealing esthetic elements include the undeveloped open areas, the lake itself, and the backdrop of the mountains. Detractants include the crowding during peak use.

c. **Swimming.** Swimming is another main activity, accounting as a primary activity for about 15% of visitation. It is concentrated at the sandy beach on the east shore. Most users of the beach do not actually swim, but sunbathe, picnic, accompany swimmers, or play volleyball. The beach often reaches capacity.

d. **Developed picnicking.** Picnicking accounts for about 10% of visitation as a main activity, but is a secondary activity for many other recreationists. It is concentrated at picnic facilities on the east shore and the west shore.

e. **Reservoir fishing.** Fishing accounts for about 25% of visitation, and 90% of this is shore fishing. Fishermen use all areas of the shoreline, but especially those areas near picnic sites and where the banks are riprapped. Boat fishing accounts for less than 5% of visitation. Ice fishing is popular on the lake.

f. **Reservoir boating.** Boating for purposes other than fishing, i.e. for waterskiing or just pleasure boating, accounts for about 10% of visitation.

g. **Public access.** A number of trails and roads are located on the project. There are asphalt foot/bike trails, asphalt circulation roads and parking lots, a nature trail, and both paved and graveled public roads used by non-recreationists.

10. **Socioeconomic.**

a. **Infrastructure.** There are water supply, sewage treatment, electric utility and telephone facilities on the project.

b. **Businesses.** A concessionaire operates a marina in the northwest corner of the lake, a wind surfing business on the southwest shore of the lake from the Lake Loop area, and a jet ski business on the southeast shore of the lake. A concessionaire sells food and beach supplies at the swim beach. Concessionaires also operate the horse stables and rifle range.

11. **Cultural Resources.** The project was surveyed in 1946, 1948, and 1982. Of 10 sites originally identified, 3 have been destroyed, and none of the remaining 7 are eligible for nomination to the National Register. They do not appear to be adversely impacted by erosion, vandalism or other agents.

ALTERNATIVES

This assessment will address alternatives that are approved or rejected via the Master Plan and that would require a Master Plan supplement to be changed in future. Alternatives that would not require a Master Plan supplement, such as siting or design decisions within an approved land classification, are not addressed here. Alternatives that would require a Master Plan supplement would require a separate environmental evaluation. Some alternative actions within an approved Master Plan's scope, such as a concession development plan, could need a separate environmental assessment later.

Three alternatives were defined: the no-action plan, the proposed plan with moderately increased intensive recreation, and a plan for greatly increased intensive recreation.

1. **Alternative 1.**
Under the no-action plan, existing master plan provisions would continue. This would allow increased facility development; it would not meet all of the growing public demands. Facilities such as team playing fields or swimming pools would not be allowed. Construction of a crossing road would require a Master Plan amendment. Use of open space for utility lines could be allowed if compatible with other uses. Trees could be planted anywhere in the open space, changing the prairie environment. No measures to improve water quality would be specified. Some proposals could not be judged against the Master Plan because it gives no consideration to certain proposals now known to be possible.

2. **Alternative 2.**
The proposed plan would allow for more facilities to meet more public outdoor recreation needs over the next 5 years: new intensive use areas adjacent to existing areas or adjacent to the project boundary, more facilities within established recreation areas, an equestrian cross-country course, extension of trails, potential new outdoor swim area, golf course development downstream of the dam, and relocation of the stable and dog trial area. Game fields would be allowed but only in areas separated from the main area by project structures or highways. It would retain 50% of project acreage as open space. It could accommodate a crossing road. Utility lines in open space areas would be allowed if compatible with other uses. Water quality improvement measures would be pursued. Tree plantings would be accommodated in Dixon Grove and along Cherry Creek. Any golf course upstream of the dam would require a Master Plan amendment.

3. **Alternative 3.**

Greatly increased intensive use would create more of an urban park environment, with added picnic areas in current open space areas, tree plantings, an off-reservoir swim area, game fields, a golf course, commercial non-water-dependent recreation facilities such as mini-golf and go-carts, an amusement park, water slides, and indoor recreation facilities (YMCA); and with public facilities such as a fire station. Obviously, this would entail more utility lines and a need for water quality efforts.

ENVIRONMENTAL EFFECTS

The effects of each alternative are addressed under each subject heading.

1. **General.**

Alternative 1 would retain conditions very similar to today's, with a gradual general increase in public use, and no significant impact. Alternative 2 would lose some open space to increased recreational development, but mainly near existing recreation areas and on the project perimeter removed from the main open space area. No significant impact would occur. Alternative 3 would be similar to Alternative 2, but have an added golf course. A golf course would reduce open space, reduce habitat, and increase visitation and its impacts; at this time it cannot be said whether the impacts would be deemed significant.

2. **Wildlife Generally and Terrestrial Habitat.**

Alternative 1 would retain the most open space, which is the best habitat, and would allow lesser, gradual increases in visitation and resulting disturbance of wildlife. Alternative 2 would cause loss of some open space habitat around the project perimeter. This habitat is near urban developments, and is lower value habitat than the main open space area. Alternative 3 would impose a golf course within the open space, reducing cover habitat and reducing diversity, and displacing prairie species; alternative 3 would also cause habitat destruction and wildlife disturbance at a variety of other locations within the project due to the many various facilities possible.

3. **Waterfowl and Shorebirds.**

None of the alternatives would be expected to have significant impacts on waterfowl or shorebirds. Most recreational activity, including many activities contemplated under Alternative 3, would be located on the uplands, and so would not significantly increase shoreline use by recreationists. Waders and shorebirds use the area mostly during migration, when

recreation use is off-peak.

4. **Fisheries and aquatics.**
None of the alternatives would be expected to have a significant adverse effect on fisheries and aquatics. Most expected recreational increases would be terrestrial. Some increase in fishing pressure would occur with any alternative.

5. **Water Quality.**
None of the alternatives would necessarily have a significant adverse effect on water quality. Again, this is because most of the expected changes would be terrestrial. Problems from on-site erosion would be expected to be minor. Erosion control measures could be conducted under any alternative, but would be facilitated by any of the new Master Plan alternatives. A golf course under alternative 3 would raise questions about fertilizers and pesticides, but such impacts would be unknown without a specific management plan.

6. **Threatened and Endangered Species.**
a. **Black-footed ferrets.** Because ferrets likely do not exist at the project, none of the alternatives is expected to affect ferrets. Alternatives 1 and 2 would not affect substantial parts of prairies dog colonies, and so would not be expected to have any potential effect on black-footed ferrets. Nevertheless, any proposed development that would be determined to pose a substantial change to prairie dog towns should be preceded by a ferret survey. Alternative 3 would pose substantial land changes, and ferret surveys would likely be advisable before approval of a golf course or certain other projects.

b. **Bald eagles.** Alternatives 1 and 2 would likely not affect bald eagles in any substantial way; facilities would tend to be located away from the area used by eagles, visitation would be similar to today's and relatively light in the winter, and eagle use would likely continue to be more sporadic than steady. Alternative 3 could introduce facilities and visitation in a way that could discourage all use by wintering eagles.

c. **Peregrine falcons.** Because peregrine falcon use of the area is uncommon, unpredictable, and likely not very important to falcons which do pass through the area, none of the alternatives would be expected to harm peregrine falcons.

7. **Pests.**
Alternatives 1 and 2 would likely not tend to increase pest/human conflicts substantially. The proposed plan (Alternative 2) would allow dredging of open water areas within the delta marshy area, but these could be designed to minimize mosquito habitat, and not much visitor use occurs in that area anyway. Alternative 3 might lead to complaints of prairie dog activity at the proposed golf course, and lead to pressure for

control. Alternative 3 could also lead to complaints about prairie dogs at several other of the contemplated facilities, and could also lead to increased human activity in the delta area, with increased mosquito encounters; this impact in itself would not be significant.

8. **Erosion.**

Neither alternatives 1 or 2 should cause significant erosion problems, especially since most shoreline areas are protected. Alternative 3 envisions a level and diversity of visitation and facility development that could lead to numerous small erosion problems on the project; however, this would be expected to consist of small problems such as roadside rill erosion and temporary construction site erosion, and would not be significant.

9. **Recreation.**

a. **General.** Alternatives 1 and 2 are similar in that they would provide recreation similar to today's, retaining the natural attractions of the recreation experience. Alternative 3 would additionally provide a golf course, which would detract from the recreational uniqueness of the area. It would allow such a level and degree of change that the nature of recreation would become more urban and developed than natural and wild; the overall change would likely be significant, though not necessarily adverse.

b. **Scenic viewing.** Alternative 1 would leave the scenic conditions relatively similar to today's. Alternative 2 would exchange open space around the perimeter and near existing recreation areas for recreation developments, decreasing esthetic quality but not to a significant degree. Alternative 3 would impose a golf course within existing open space, visible by some but not all project visitors, detracting from natural esthetics and increasing the landscaped esthetics. Alternative 3 could also impose structures and landscape changes of such an urban nature and in such diverse locations that most visitors would be affected, and the overall natural character of the area would be lost to a more urban, developed character; this could contribute to a significant impact.

c. **Swimming.** All alternatives would likely cause gradual general increases in swimming beach use. It already reaches capacity often and is regulated; it would reach capacity more often or more quickly with the expected growth in recreation demand. With continued State regulation, impacts should not be significant.

d. **Developed picnicking.** Alternatives 1 and 2 would allow some increase in picnicking facilities and use within or adjacent to existing areas. Alternative 3 would also provide picnicking in current open space areas, and so would enhance picnicking.

e. **Reservoir fishing.** All alternatives would allow

increased fishing as demand grows, thus enhancing this activity.

f. **Reservoir boating.** All alternatives would allow increased boating as demand grows, enhancing this activity.

g. **Public access.** All alternatives would allow increased public access. All alternatives would allow increased development of trails and roads, thus enhancing public access.

10. **Socioeconomic.**

a. **Infrastructure.** All alternatives would allow increased infrastructure such as utilities, and so would enhance these resources. Each alternative that would allow more recreation would also entail more infrastructure.

b. **Impacts on Businesses.** All alternatives would allow continuation of existing businesses and addition of others, with little expected cannibalism by new businesses on existing ones. Thus, business resources would be enhanced.

11. **Cultural Resources.**

No significant impacts to cultural resources would be expected from any of the alternatives. The 7 sites are currently not being degraded by project use. If excavation of dirt was involved, a cultural resource review prior to construction would be made.

PUBLIC COORDINATION

Drafts of the proposed alternative's Master Plan were distributed to the State Division of Wildlife and other agencies.

The U.S. Fish and Wildlife Service was contacted and their input was solicited pursuant to the Endangered Species Act and the Fish and Wildlife Coordination Act. They provided a list of protected species for the area, and these were assessed in this assessment.

CONDITIONAL AND MITIGATIVE MEASURES

Any earthmoving activity shall be preceded by a cultural resource review by the Omaha District office. If any cultural resources are discovered during construction, work shall cease until the District Engineer has been notified and has given written clearance to proceed.

If any proposal would affect prairie dog towns, FWS should be consulted to determine whether a black-footed ferret survey would be required.

At this time, no other conditional or mitigative measures are specified, in part because no specific physical or managerial activities are scheduled, and in part because the proposed Master Plan lays out general conditions and mitigative precautions on land use to protect the resources.

Prepared by: Steve Rothe
Environmental Resources Specialist

Date: 3/20/91

Approved by: Gerard E. Mick
Acting Chief, Environmental Analysis Branch

Date: 4-08-91

REFERENCES

COLORADO DIVISION OF PARKS AND OUTDOOR RECREATION

a. Armstrong, Caroline. Numerous telecons, 1989 and 1990.
b. Foreman, Chris. Several telecons, 1989 and 1990.
c. "Cherry Creek State Recreation Area General Management Plan", undated.

COLORADO DIVISION OF WILDLIFE

a. Weber, Dave. Letter dated 20 June 1990 to Kenneth Cooper, Corps of Engineers.
b. Weber, Dave. Letter dated 25 June 1990 to Kenneth Cooper, Corps of Engineers.
c. Weber, Dave. Telecon, 2 July 1990.
d. Weber, Dave. Telecon, 6 July 1990.
e. "CDOW Stocking Ticket Records", 1973-1983, 1984-86, and 1987-88, computer run dated 6 September 1989.

U.S. FISH AND WILDLIFE SERVICE

a. Carlson, LeRoy W. Letter dated 3 November 1989 to Richard Gorton, Corps of Engineers.
b. Noonan, Bill. Telecon, 2 October 1989.
c. Lockhart, Mike. Telecon, 16 August 1990.

CORPS OF ENGINEERS

a. "Operational Management Plan, Design Memorandum No. CC-9, Cherry Creek Lake, Colorado", June 1983.

OTHER

a. Davis, Ted. Colorado State Health Dept. Telecon, 30 January 1990.
b. Conright, Ken. Tri-County Health Dept. Telecon, 30 January 1990.
c. Kinshella, Rick. Tri-County Health Dept. Letter dated 13 June 1990 to Kenneth Cooper, Corps of Engineers.

CEMRD-CW-PR (CEMRO-PD-A/11 May 90) (1110-2-140a) 3d End
Mr. Galloway/jao/221-7280
SUBJECT: Design Memorandum CC-14, Master Plan, Cherry Creek Lake, Colorado

DA, Missouri River Division, Corps of Engineers, P.O. Box 103, Downtown Station, Omaha, NE 68101-0103 3 December 1992

FOR Commander, Omaha District, ATTN: CEMRO-PD-M

1. Subject master plan is approved.

2. Page changes made as arranged informally are satisfactory. The following revised pages which you submitted separately are acknowledged and approved: i thru vi, 3 thru 6, 1-3 and 4, 1-7 thru 10, II-25 thru 30, II-59 and 60, II-79 and 80, II-109 and 110, II-123 and 124, III-7 (Remove III-8 and 9), VI-1 and 2, and VI-27 and 28.

FOR THE COMMANDER:

3 Encls
wd all encls

ARVID L. THOMSEN
Director, Civil Works and Planning

CF (w/cy all encls):
CECW-ON (per ER 1130-2-435, 10(2))

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
215 NORTH 17TH STREET
OMAHA, NEBRASKA 68102-4978

REPLY TO
ATTENTION OF

CEMRO-PD-A (1110-2-240a) 11 May 1990

MEMORANDUM FOR Commander, Missouri River Division,
ATTN: CEMRD-PD

SUBJECT: Draft Design Memorandum No. CC-14, Master Plan, Cherry Creek Lake, Colorado

1. Submitted for review and comment are ten copies of the subject draft DM.

2. This updated Master Plan was prepared in accordance with ER 1130-2-435, dated 30 December 1987.

3. All formal and informal comments provided by Missouri River Division on 20 November 1989 on the preliminary draft Master Plan have been addressed.

4. This document is receiving concurrent in-house review and has been distributed for public comment. The public comment period ends 15 June 1990.

5. An Environmental Analysis of the impacts of development proposed in the final Master Plan will be prepared after comments from the public have been received.

6. Some data for the plates showing land classifications, outgrants, and existing and proposed development has not yet been entered in the Geographic Information System (GIS), which will also be used in the Operational Management Plan, reports prepared by Real Estate Division, and studies conducted by Engineering Division. Plates printed from GIS data will be included in the final Master Plan.

FOR THE COMMANDER:

KENNETH S. COOPER
Chief, Planning Division

Encl
(10 cys)

CEMRD-PD-R (CEMRO-PD-A/11 May 90) (1110-2-240a) 1st End Mr. Galloway/drs/221-7280
SUBJECT: Draft Design Memorandum No. CC-14, Master Plan, Cherry Creek Lake, Colorado

DA, Missouri River Division, Corps of Engineers, P.O. Box 103 Downtown Station, Omaha, Nebraska 68101-0103 25 June 90

FOR Commander, Omaha District, ATTN: CEMRO-PD-A

The subject draft DM has been reviewed. It is generally a well-documented and thorough presentation and we have few comments. The most significant issues are noted below and an annotated copy of the DM is returned separately showing minor questions and issues or editorial notes.

a. Possible changes in project structures are discussed on page 1-9. The potential raise of the dam crest is still under study and a number of significant questions remain. We recommend that this point be emphasized and it should be noted that planning issues and environmental concerns will be detailed in separate design memoranda.

b. Some of the language in discussing spillway maintenance on pages 3-7 and 3-8 is equivocal, leaving the impression that spillway channel maintenance has been, or could be, compromised. This should be clarified in positive terms.

c. The treatment of cost-shared development and cost estimates on page 6-33 and exhibit B need clarification and additional explanation. Reviewers' questions include:

(1) Does the 1974 contract apply only to initial development? Why are we using a sixteen-year old contract as authority for current cost-sharing? Cost-sharing beyond funding currently programmed should probably be subject to a new contract.

(2) Is the facilities list in Exhibit B to the Master Plan the same as Exhibit B to the contract?

(3) It is not clear whether cost estimates have been reviewed by the District Cost Engineering Branch or what account will be used. The Code of Accounts format is required for estimated costs from Construction General funds.

d. Engineering Division recommends that an overall utility study be made in order to assure that utility extensions are made in a logical and cost-effective manner.

FOR THE COMMANDER:

Encl
wd (10 cys)

ARVID L. THOMSEN
Director, Planning Directorate

CEMRO-PD-E (CEMRO-PD-A/11 May 90) (1110-2-240a) 2d End
Peake/cal/4474
SUBJECT: Design Memorandum CC-14, Master Plan, Cherry Creek Lake, Colorado

DA, Omaha District, Corps of Engineers, 215 N. 17th Street, Omaha, Nebraska 68102-4978

14 MAY 1992

FOR Commander, Missouri River Division

1. Submitted for approval are 10 copies of the updated Master Plan for Cherry Creek Lake, Colorado, prepared in accordance with ER 1130-2-435. A copy of this letter is bound in each copy of the design memorandum.

2. Responses to Missouri River Division's 25 June 1990 comments on the April 1990 draft Master Plan have been incorporated, as discussed below.

a. Comment a is addressed on pages I-8 and III-8. The Reconnaissance Report: Hydrologic Improvement Assessment was revised and resubmitted for approval 14 September 1990 and was approved 24 December 1991. The Omaha District will be requesting funding for the feasibility study in the near future.

b. Comment b is addressed on pages I-9, III-8, and III-9. Hydraulic studies will be conducted by the Omaha District in Fiscal Year 1992 to determine whether removal of some or all of the sediments in the spillway is justified.

c. Comment c is addressed by the revised discussion of cost-shared development on page VI-42 and the elimination of Exhibit B of the draft Master Plan.

d. In response to comment c(1), the Omaha District has determined that the 1974 contract does not apply only to initial development. As discussed on pages I-6 and I-7, recreational facilities listed in Exhibit B of the contract were not cost-shared by the Corps in the 1970's as initial development. Because the 1974 contract included no expiration date, facilities listed in Exhibit B of the contract which are newly developed are still eligible for cost-sharing if they expand existing (initial) development to meet increased recreational needs rather than replace existing development. According to Article 2(e) of the contract, it can only be rescinded by mutual agreement. On 22 February 1991, the Colorado Division of Parks and Outdoor Recreation (DPOR) stated in writing that it was their belief that the existing contract was still the appropriate means to provide the intended recreation facilities, and the basic objectives of the original contract were still appropriate. The Omaha District will continue to execute the terms of the cost-share contract in

good faith, as long as both parties are not willing to terminate the contract. Cost-sharing data on page VI-42 indicate that the maximum dollar value of development remaining which can be cost-shared under the 1974 contract is $1,250,200, of which the Federal share would not exceed $625,100. Federal funding will be requested through the normal budget process, in support of authorized cost-shared development only. Cost-sharing of development greater than $1,250,200 or of facilities not included in, or exceeding unit quantities listed in, Exhibit B of the contract would require a supplemental agreement to the 1974 contract or a new cost-share agreement.

e. In response to comment c(2), the facilities list in Exhibit B of the draft Master Plan was the same as Exhibit B of the contract. Exhibit B of the draft Master Plan has been replaced by citations of the total estimated cost of facilities listed in Exhibit B of the contract and the total cost of development that was cost-shared through April 1991 under the contract. No cost-share payments were made after April 1991.

f. In response to comment c(3), the Master Plan does not include cost estimates of proposed facilities. The updated cost estimates on page 6-35 of the draft Master Plan and in Exhibit B of the draft Master Plan were not reviewed by the Cost Engineering Branch because they were based on price level increases. However, District Counsel determined the price level increases were not applicable to the 1974 contract. The only cost estimate in the Master Plan is the maximum total cost of development eligible for cost-sharing under the 1974 contract. The lessees were unable to provide cost estimates of development proposed in the Master Plan. However, the District evaluates project costs when lessees submit plans and specifications for approval. Operation and Maintenance, General funds are used for cost-sharing recreational development at operating projects; the Code of Accounts format is not required.

g. In response to comment d, the DPOR is responsible for funding and conducting such a utility study. The DPOR submits all development proposals to the Omaha District for coordination, review, and approval. Maintenance Engineering Branch of Operations Division reviews and coordinates utility plans with all appropriate District elements, including those in Engineering Division, prior to District approval.

3. The NEPA requirements for the recreational development and other resource uses proposed in this updated Master Plan have been met. The draft Master Plan was circulated for public comment 11 May 1990 through 15 June 1990. Omaha District responses to the comments received are included in Chapter IV of

the Master Plan. An environmental assessment (EA) of the recreational development and resource uses proposed in the Master Plan was completed in March 1991, and a Finding of No Significant Impact (FONSI) was signed 28 April 1991. A copy of the EA and FONSI are enclosed.

4. The text of the updated Master Plan was essentially completed in April 1991, when the FONSI was signed. Mr. Galloway suggested that April 1991 would be the most appropriate date for the cover of the Master Plan. Submittal of the Master Plan for approval has been delayed by the unusually long time required for preparation of the plates using the Geographic Information System data base. Paragraph 9.c. of ER 1130-2-435 states that in preparation of Master Plans, "The use of automated geographic information systems is encouraged to perform resource analysis and mapping tasks as a method of increasing efficiency and reducing long term costs."

5. Minimal changes to the text of the Master Plan were made after April 1991. Population and socioeconomic data were updated by final 1990 U.S. Bureau of the Census data. The projected use of the Federal Research Facility buildings for dry boat storage was included on page VI-16; the DPOR is now managing the Federal Research Facility area, and the marina concessionaire began dry boat storage in the fall of 1991 for two years on a trial basis. NEPA compliance requirements were met prior to the Omaha District's approval of the DPOR's dry boat storage request. Some facilities cited in the text as development needs were constructed by the DPOR in 1991; they appear as existing facilities on the development plan plates, dated February 1992.

6. Your approval of this Master Plan is requested.

for STEWART H. BORNHOFT
Colonel, Corps of Engineers
Commanding

3 Encls
1. Master Plan (10 cys)
2. Envir Assessment
3. FONSI

DESIGN MEMORANDUM CC-14
MASTER PLAN
CHERRY CREEK LAKE, COLORADO

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PERTINENT DATA

GENERAL

Location of Dam	On Cherry Creek, South Platte River basin, 11.4 miles upstream from mouth, in Arapahoe County, Colorado, southeast of the city of Denver
Operating and Jurisdictional Agency	Corps of Engineers, Omaha District
Purposes	Flood control, recreation
Authorization	Flood Control Act of 19 August 1941, as amended (Public Law 228, 77th Congress, 1st session) Flood Control Act of 22 December 1944, as amended (Public Law 534, 78th Congress, 2d session)
Year Construction Started	1946
Date of Closure	October 1948
Date of Initial Fill (base of flood control pool)	March 1960
Location of Damtender	At Chatfield Dam
Project Cost	$15,381,740 as of March 1990

DAM AND EMBANKMENT

Type of Fill	Rolled earth
Fill Quantity	13,000,000 cubic yards
Abutment Formations	Sandstone, clay, and silt
Length of Dam	14,300 feet
Streambed Elevation at Intake	5504 feet m.s.l.
Top of Dam	5644.5 feet m.s.l.

DAM AND EMBANKMENT (Cont'd)

Height of Dam	141 feet
Width at Top	30 feet

SPILLWAY

Type	Uncontrolled side-channel canal through natural ground, discharging into adjacent Toll Gate Creek	
Canal Length	12,050 feet	
	Original Design	Existing Conditions
Crest Elevation	5598.0 feet m.s.l.	5608.7 feet m.s.l.
Approach Width	67 feet	Varies
Outlet Width	45 feet	Varies
Discharge Capacity	38,350 c.f.s. at elevation 5636.2 feet m.s.l., original maximum pool	35,000 c.f.s. at elevation 5639.5 feet m.s.l. (63 percent of PMF; with 5 feet of freeboard)

OUTLET WORKS

Type	Triple barrel concrete conduit with controls in intake structure
Number and Size of Conduits	2 - 8 x 12-foot oval conduit 1 - 12-foot circular conduit
Conduit Length	679.5 feet
Gates (Number, Size, Type)	5 - 6 x 9 feet - hydraulic slide 2 - 18-inch knife gates
Invert Elevation of Side Conduits	5504 feet m.s.l.

OUTLET WORKS (Cont'd)

	Original Design	Existing Conditions
Discharge Capacity, pool at spillway crest (two side conduits; discharge not permitted through center conduit except in extreme emergency)	8,100 c.f.s. at elevation 5598.0 feet m.s.l.	8,500 c.f.s. at elevation 5608.7 feet m.s.l.

RESERVOIR

Drainage Area	385 square miles upstream from Cherry Creek Dam
Length	1.5 miles at elevation 5550 feet m.s.l.
Average Width	1.12 miles at elevation 5550 feet m.s.l.
Shoreline	8 miles at elevation 5550 feet m.s.l.
Maximum Depth (excludes area in front of intake structure)	26 feet at elevation 5550 feet m.s.l.

	Original Design	Existing Conditions
Maximum Pool	5636.2 feet m.s.l.	Above 5644.5 feet m.s.l.
Top of Flood Control Pool	5598.0 feet m.s.l., 2,640 surface acres	5608.7 feet m.s.l., 3,101 surface acres
Top of Multipurpose Pool	5550.0 feet m.s.l., 884 surface acres	5550.0 feet m.s.l., 844 surface acres
Top of Inactive Pool	None	None
Surcharge Storage	5598 - 5632.2 feet m.s.l. 134,605 acre-feet	5608.7 - 5644.5 feet m.s.l. 142,069 acre-feet
Flood Control Storage	5550 - 5598 feet m.s.l. 80,835 acre-feet	5550 - 5608.7 feet m.s.l. 110,037 acre-feet

RESERVOIR (Cont'd)

	Original Design	Existing Conditions
Multipurpose Storage	5504 - 5550 feet m.s.l. 15,133 acre-feet	5504 - 5550 feet m.s.l. 12,805 acre-feet
Gross Storage (below top of flood control pool)	95,968 acre-feet	122,842 acre-feet
Maximum Daily Inflow	6,150 c.f.s.	16 June 1965
Maximum Daily Outflow	560 c.f.s.	7-8 August 1965
Maximum Hourly Inflow	56,000 c.f.s. 7-8 p.m.	16 June 1965
Estimated Annual Sediment Inflow (below multipurpose pool)	61 acre-feet per year since 1950	

LAND

Total Acquired in Fee	5,783.16 acres
Total Fee Disposed	438.51 acres
Current Fee Holdings	5,344.65 acres
Pool Acres at Elevation 5550.0 feet m.s.l.	844.00 acres
Fee Acres above Elevation 5550.0 feet m.s.l. (available for project purposes)	4,500.65 acres
Easements	131.35 acres
Leases	0.73 acres
Allocations of Project Fee Acres:	
Operations	5,345 acres
Recreation	0 acres
Fish and Wildlife	0 acres
Mitigation	0 acres
Land Classifications above Elevation 5550.0 feet m.s.l.:	
Project Operations	756 acres
Recreation	591 acres
Mitigation	0 acres
Environmentally Sensitive Areas	0 acres
Multiple Resource Management	3,154 acres
Easement Lands	131 acres

CORPS OF ENGINEERS REPORTS, CHERRY CREEK LAKE, COLORADO

DESIGN MEMORANDUM NUMBER	TITLE	DATE SUBMITTED	DATE APPROVED
--	Definite Project Report	Jan 44	Mar 44
		Rev May 44	n.a.
--	Historical Report on the Cherry Creek Dam and Reservoir Project	Sep 50	n.a.
CC-1	Reporting Network	Mar 55	
		Rev Sep 55	Dec 55
CC-2	Master Plan	Apr 59	May 59
CC-2(C1)	On-Project Signs	Dec 64	Dec 64
--	Reservoir Regulation Manual	May 67	Feb 68
		Rev Aug 70	Oct 71
CC-2(C2)	Updated Public Use Plan	Sep 71	Jan 72
CC-2(C2)	Appendix B, Natural Resources Management Plan	May 77	Jun 78
CC-2(C2)	Appendix C, Fire Protection Plan	Sep 76	Sep 76
CC-2(C2)	Appendix E, Safety Plan	Aug 76	Aug 76
CC-2(C2)	Appendix F, Interpretive Prospectus	Apr 75	May 75
CC-3	Public Access Roads	Nov 59	Jan 60
CC-4	Spillway Fencing	Feb 74	Mar 74
CC-5	Conduit Security Protection	Feb 75	Sep 78
CC-6	Fencing Downstream Area	Nov 77	
--	Water and Related Land Resources Management Study, Metropolitan Denver and South Platte River and Tributaries, Colorado, Wyoming, and Nebraska	Jan 80	n.a.
--	Operation and Maintenance Manual	Nov 80	n.a.
CC-7	Emergency Gate Installation	Apr 81	Ret Oct 81
		Rev Aug 82	Dec 82
CC-8	Rehabilitation of Spillway Channel	May 83	Ret Nov 83
		Rev Mar 84	Mar 84
CC-9	Operational Management Plan	Jul 83	Dec 83
CC-10	Sediment Removal	Jan 85	Mar 86
CC-11	Spillway Performance Review	Jan 85	Mar 85
--	Reconnaissance Report - Seismic Evaluation and Analysis	Oct 85	Apr 86
CC-12	Low-Flow Outlet Installation	Aug 87	Nov 87
--	Reconnaissance Report: Hydrologic Improvement Assessment	Mar 88	Ret Jun 88
		Rev Sep 88	Ret Apr 89
		Rev Sep 90	Dec 91
CC-13	Seismic Evaluation	Oct 88	Ret May 89
CC-14	Master Plan	May 92	

ACRONYMS AND ABBREVIATIONS

AF	acre-feet
BA	Biological Assessment
BoR	U.S. Bureau of Reclamation
C	Celsius
CCBWQA	Cherry Creek Basin Water Quality Authority
CFR	Code of Federal Regulations
c.f.s.	cubic feet per second
COE	U.S. Army Corps of Engineers
DM	Design Memorandum
DOW	Colorado Divison of Wildlife
DPOR	Colorado Division of Parks and Outdoor Recreation
DPR	Definite Project Report
DRCOG	Denver Regional Council of Governments
DWD	Denver Water Department
EA	Environmental Assessment
EIS	Environmental Impact Statement
EM	Engineer Manual
EPA	Environmental Protection Agency
ER	Engineer Regulation
F	Fahrenheit
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
FWS	U.S. Fish and Wildlife Service
FY	fiscal year
g.p.m.	gallons per minute
GSA	General Services Administration
HMR	Hydrometeorological Report
IDF	Inflow Design Flood
LCA	Local Cost-Share Agreement
LID	Local Irrigation District
LWCF	Land and Water Conservation Fund

ACRONYMS AND ABBREVIATIONS (Cont'd)

mg/L	milligrams per liter
ml	milliliter(s)
MOU	Memorandum of Understanding
m.p.h.	miles per hour
MRD	Missouri River Division, U.S. Army Corps of Engineers
m.s.l.	mean sea level
NEPA	National Environmental Policy Act
NP	National Park
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRA	National Recreation Area
NRHP	National Register of Historic Places
NRMS	Natural Resource Management System
OMP	Operational Management Plan
PMF	Probable Maximum Flood
PMSA	Primary Metropolitan Statistical Area
p.p.m.	parts per million
ROW	right-of-way
RTD	Regional Transportation District
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SCS	U.S. Soil Conservation Service
SP	State Park
SRA	State Recreation Area
Stat.	Statutes
U.S.C.	United States Code
USFS	U.S. Forest Service

CHAPTER I

INTRODUCTION

The Cherry Creek project is included in the comprehensive plan for the development of the Missouri River basin for flood control and other purposes approved in 1944 (the Pick-Sloan plan). Plate 1 shows the Cherry Creek project location. The dam was constructed across Cherry Creek upstream from Denver in an area which was rural in character when the dam was completed in 1950. Metropolitan Denver's growth since then has caused the project to be nearly surrounded by urban development.

The project's urban location has resulted in such heavy visitation that carrying capacity controls have had to be implemented. In 1988, visitation approximated 350 persons per project acre and over 1,000 visitors participated in water-based activities for each lake acre. Because the majority of the project land acres are in open space, the project is an oasis for wildlife in the urbanized area. Portions of the project presently provide excellent wildlife habitat. Project management and development must continue to provide for existing and potential fish and wildlife habitat needs as well as outdoor recreation needs.

The urban development which has made the Cherry Creek Lake project so important to both people and wildlife has also resulted in deterioration of land and water resources at the project through erosion, sedimentation, and degradation of water quality. Although steps are being taken to resolve these problems, much remains to be done if the Cherry Creek Lake project is to continue to meet the needs of the Denver area's growing, increasingly outdoor-recreation-oriented population.

PROJECT HISTORY AND AUTHORIZATION

PREAUTHORIZATION

The City of Denver is located at the confluence of the South Platte River and one of its major tributaries, Cherry Creek. The Cherry Creek drainage basin is shown in plate 2.

Prior to the construction of Cherry Creek Dam, Denver was subject to frequent flooding from Cherry Creek. The flood of 3 August 1933 was the most destructive flood of record in Denver. Floodwaters overtopped and destroyed Castlewood Dam, which had been constructed in 1890 by the Denver Water Storage Company 35 miles upstream from Denver for storage of irrigation water. The flood damages made the citizens of Denver aware that the improvements which had been made to the Cherry Creek channel within the city after the flood of 1912 offered insufficient protection. In 1935 and 1936, Kenwood Dam was constructed by the City and County of Denver as a Federal Public Works Administration project 5.5 miles upstream from the city limits. The dam was sized to protect Denver from the maximum flood of record. However, the magnitude of a storm on 30 May 1935, which occurred (fortunately for Denver) just east of the Cherry Creek basin, cast serious doubt on the adequacy of the Kenwood Dam. Denver citizens believed the flooding problem to be beyond their ability to solve; consequently, they formed the Cherry Creek Flood Control Association, which sought Federal assistance for Cherry Creek flood control measures.

A preliminary examination and survey for flood control on Cherry Creek and its tributaries was authorized by Congress on 28 August 1937 (Public Law 406, 75th Congress, 1st session). The preliminary examination report found that a flood problem existed and recommended that a survey be made in the interests of flood control in combination with other uses of water. The survey report was submitted to Congress by the Secretary of War on 14 July 1939 and was printed as House

Document 426, 76th Congress, 1st session. The survey report found that the Inflow Design Flood (IDF) would destroy Kenwood Dam and recommended that two additional dams be constructed. One would be located in the upper Cherry Creek basin at the site of the former Castlewood Dam, with storage for irrigation and flood control. The other would be in the lower Cherry Creek basin, 1.25 miles above the Kenwood Dam, and would have storage only for flood control. The system of these two reservoirs, with Kenwood Reservoir acting as a reregulation facility, was expected to provide complete protection to Denver against the most adverse flood conditions reasonably anticipated on Cherry Creek.

AUTHORIZATION

The Cherry Creek project was authorized for flood control and other purposes by the Flood Control Act approved 19 August 1941, Public Law 228, 77th Congress, 1st session, in accordance with the recommendations of the Chief of Engineers in House Document 426, 76th Congress, 1st session.

POSTAUTHORIZATION

The Definite Project Report (DPR) was submitted in January 1944 and approved by the Chief of Engineers in March 1944. The project recommended in the DPR differed in scope from the one originally authorized. Design floods calculated for the DPR using new U.S. Weather Bureau data would have required such increases in the size of the authorized dams that new dam sites in both the upper and lower Cherry Creek basins were investigated. Neither the Castlewood Dam nor a dam at any other newly investigated site in the upper Cherry Creek basin could be economically justified, and Castlewood Dam was recommended to be deferred indefinitely. Castlewood Dam was deauthorized by the Water Resources Development Act of 1986, Public Law 99-662.

The DPR recommended that all the flood control storage be contained in one dam constructed at the site of the Kenwood Dam. Denver would be

completely protected from Cherry Creek floodwaters because the spillway flows would be routed through Toll Gate Creek and Sand Creek, entering the South Platte River downstream from Denver. The reservoir would provide for 10,000 acre-feet of dead storage to accommodate future sediment deposition and 85,000 acre-feet of flood control storage. The designs would also accommodate future modifications to allow ultimate development as a multiple-purpose dam and reservoir.

In 1943, during preparation of the DPR, the Bureau of Reclamation (BoR) requested that Cherry Creek Dam include an additional 85,000 acre-feet for irrigation and 10,000 acre-feet for sediment storage in connection with the Bureau's proposed Blue-South Platte diversion project. The DPR recommendations included constructing the dam to multiple-purpose height but incorporating only the features of the outlet conduits and spillway necessary for flood control. Interests for irrigation and other water uses would pay for the required modifications and repay an equitable portion of the project construction costs at some future time when the storage is used.

The Cherry Creek project was essentially ready for construction when Public Law 228, 77th Congress, was amended by the Flood Control Act approved 22 December 1944, Public Law 534, 78th Congress, 2d session, in accordance with Senate Document 247, 78th Congress, 2d session (the Pick-Sloan plan). Public Law 534, 78th Congress, authorized the completion of the plan approved 18 August 1941 and included the Cherry Creek project in the comprehensive plan for the development of the Missouri River basin.

THE CHANGING ROLE OF THE RESERVOIR

Public Law 534, 78th Congress, required, for the first time, consultation with the affected States during the preparation of plans for flood control projects. During this coordination, Colorado water rights interests objected to the use of the 10,000-acre-foot pool for conservation, recreation, and other purposes in the initial phase of the

project. As a result of a public hearing held by the Colorado Water Conservation Board on 22 April 1946, the dead storage pool was eliminated "as long as the dam was used solely for flood control purposes."

Section 4 of Public Law 534, 78th Congress, provided authorization for development of recreation facilities at the Cherry Creek project. However, it was felt that recreation potential would be minimal. The project would be operated as a dry reservoir prior to initiation of irrigation storage. It was expected that even after irrigation storage was initiated, the annual 50-foot fluctuations in pool levels would restrict recreation facilities to a few floating boat docks. However, storage of water for irrigation purposes was never initiated. In 1968, the BoR relinquished to flood control the 85,000 acre-feet of storage which had been reserved for irrigation. The proposed modifications to the spillway and outlet works were never constructed.

Dam construction began in 1946 and was completed in 1950. The project area upstream from the dam was leased to the Colorado Game and Fish Department for wildlife management purposes in 1957. In 1957, the dam impounded floodwaters for the first time, and many recreators were attracted to the project. A 1,500-acre-foot pool was retained in the reservoir by mutual agreement between the Corps and the State of Colorado, subject to release at the request of the State Engineer. In the spring of 1958, the Corps approved the State's request that storage of future floodwaters be increased up to a 10,000-acre-foot conservation pool to increase recreation opportunities and fish and wildlife benefits.

A park and recreation lease for the project area upstream from the dam was executed with the State of Colorado on 16 June 1959. Almost immediately, the new Cherry Creek State Recreation Area (SRA) received extensive recreation use. In March 1960, the Corps approved a request by the State of Colorado to increase the conservation pool to 15,000

acre-feet at 5550 feet mean sea level (m.s.l.), because it would greatly increase recreation and fish and wildlife benefits. This increase in storage was calculated to have a relatively insignificant effect on the flood control capability of the reservoir.

Facilities for recreation and fish and wildlife development were proposed in Design Memorandum (DM) CC-2, Master Plan for Reservoir Development, Cherry Creek Dam and Reservoir, approved in May 1959. These facilities were constructed in the early 1960's. The Corps constructed access and circulation roads and parking lots. The State of Colorado provided some roads and parking areas, fishing access points, picnic areas, a campground, a swim beach, a changehouse, and a marina. The State of Colorado Division of Parks and Outdoor Recreation (DPOR) operates and maintains the Cherry Creek SRA.

Cherry Creek Lake project lands downstream from the dam, which were not included in the DPOR's lease, were leased to the City and County of Denver for public park and recreation purposes in August 1961. Denver developed the J.F. Kennedy Park in phases on these project lands and adjacent lands with municipal facilities for golf, softball, and soccer. Leased areas at the Cherry Creek Lake project are identified on plate 3.

By 1970, the population within a 25-mile radius of the Cherry Creek project had grown to 1.3 million, a 25-percent increase over 1960. Visitation to the project had skyrocketed from 170,000 in 1959 to almost 1 million in 1970, the highest visitation for any park in the Colorado State Park system. To meet the increased demand for water-based recreation facilities in the Denver area, additional recreation facilities were proposed in Design Memorandum No. CC-2 (C-2), Updated Public Use Plan, Cherry Creek Lake, Colorado, approved in January 1972. A local cost-share agreement (LCA) between the Corps and State of Colorado, through the DPOR, for these recreation facilities was executed in June 1974. Facility construction under the LCA was not initiated until 1984 because in the 1970's, Cherry Creek SRA recreation facilities

were constructed by the State of Colorado using funds made available under the provisions of the Land and Water Conservation Fund (LWCF) Act of 1965. The State preferred to use LWCF monies because under the LWCF Act, the Federal share of costs was greater than the 50 percent specified in the LCA with the Corps.

As urban development in the Cherry Creek basin grew, the need for game fields and other municipal park facilities in the vicinity of Cherry Creek Lake increased. The DPOR was unable to develop these facilities at the Cherry Creek SRA. According to Colorado Revised Statute 33-1-101(2)(c), the State could "not be responsible for development of neighborhood parks or recreation areas that are mainly designed to provide facilities for team or individual sports."

To meet these outdoor recreation needs, the Corps and the DPOR determined that parcels of land separated from the rest of the SRA by project structures and/or heavily traveled roadways might be appropriate for development by local jurisdictions. Prior to development of municipal park facilities on such SRA lands, these lands would need to be extracted from the DPOR's lease and included in a lease to a local public sponsor. Concurrence from the State of Colorado would be necessary before any action could be taken to remove land from the DPOR's lease.

Based on these policies, the spillway area east of Parker Road was withdrawn from the DPOR's lease, and most of this land was leased to the City of Aurora in September 1979 to allow development of Crestridge and Olympic Parks. Likewise, the City of Greenwood Village began developing a portion of Village Greens Park in September 1982 on land withdrawn from the DPOR's lease. These leased areas are shown on plate 3.

POTENTIAL CHANGES IN PROJECT STRUCTURES

Corps dams located above populated areas are designed to store and/or pass a PMF without overtopping the embankment. The PMF is estimated using probable maximum precipitation estimates developed by the National Weather Service. The most recent precipitation estimates for this area, published in Hydrometeorological Report (HMR) 55 in March 1984 and updated as HMR 55A in June 1988, were applied to the Cherry Creek Lake project. It was found that the reservoir could safely pass no more than 63 percent of the PMF with adequate freeboard.

The "Reconnaissance Report: Hydrologic Improvement Assessment, Cherry Creek Lake, Colorado" (Hydrologic Improvement Assessment), which was prepared by the Omaha District, considers a number of alternatives to enable the project to safely pass the PMF. The alternatives included widening of the existing spillway, adding a new spillway at one of three locations in the embankment, construction of an additional reservoir (Castlewood) approximately 30 miles upstream from Cherry Creek Lake, hardening the dam face, raising the dam crest, and no action. The alternatives were considered individually and in combination with each other. A dam crest raise of 9 to 19 feet would enable the project to pass from 82 to 100 percent of the PMF with freeboard under existing developed conditions. The reconnaissance report has been approved and will lead to a more comprehensive feasibility study. The feasibility study would focus on the alternatives with the most merit as identified in the reconnaissance report; these include raising the dam or construction of a second spillway in the area of the left abutment. The feasibility study would include studies necessary to comply with the National Environmental Policy Act (NEPA), including an assessment of the environmental and social impacts of the alternatives considered. The feasibility study would lead to a recommended plan for resolving the dam safety issues. A supplement to the Master Plan would also be prepared in conjunction with the feasibility study to address the impact of any structural changes on land use and related recreation development and use.

Based on the preliminary findings of the reconnaissance report, it is unlikely that the recommended plan will include widening of the existing spillway channel. The hydraulic efficiency and capacity of the spillway channel have been gradually reduced. Reduction of hydraulic capacity first began when sediments from weathering of the steep side slopes sloughed into the channel. The resulting irregular surface of the channel bottom prevented drainage and caused wetlands to form. These wetlands and associated vegetation, plus its relative inaccessibility to humans, make the area quite valuable for wildlife. In addition to open water there is associated upland vegetation, thus providing a variety of habitats. The wetlands made it difficult for maintenance vehicles to gain access to the channel bottom, allowing trees to grow on the channel bottom and side slopes. If the hydraulic efficiency of the spillway channel continues to be reduced, a significant flood event would have the potential to produce higher pool elevations and subsequently could cause the dam to overtop sooner. To maintain hydraulic efficiency, all trees were removed from the spillway channel bottom and the lower portion of the side slopes in December 1983. New tree growth on the bottom and lower side slopes of the spillway channel is removed periodically on an as-needed basis; it was removed in 1987 and 1991.

PURPOSE AND SCOPE OF THE MASTER PLAN

PURPOSE

The Master Plan provides direction for project development and use. It is based on a combination of responses to regional needs, resource capabilities and suitabilities, and expressed public interests consistent with authorized project purposes and pertinent legislation. The Master Plan provides a District-level policy perspective distinct from the project-level implementation emphasis of the Operational Management Plan (OMP). The detailed management and administration provisions of the OMP and the Annual Management Programs are the implementing guidelines for the policies in the Master Plan. The broad intent of this Master Plan is to document policies and analyses which do the following:

- Determine appropriate uses and levels of development of project resources;

- Provide a framework within which the OMP and Annual Management Programs can be developed and implemented; and

- Establish a basis on which outgrant and recreation development proposals can be evaluated.

This updated Master Plan has been prepared in accordance with guidance contained in Engineer Manual (EM) 1110-2-400 (Engineering and Design - Recreation Planning and Design Criteria); Engineer Regulation (ER) 200-2-2 (Environmental Quality - Procedures for Implementing NEPA); ER 1105-2-20 (Planning - Project Purpose Planning Guidance); ER 1105-2-167 (Planning - Resource Use: Establishment of Objectives); ER 1130-2-400 (Project Operation - Management of Natural Resources and Outdoor Recreation at Civil Works Water Resource Projects); ER 1130-2-414 (Project Operation - Natural Resource Management System); ER 1130-2-435

(Project Operation - Preparation of Project Master Plans); and ER 1165-2- 400 (Water Resource Policies and Authorities - Recreation Planning, Development, and Management Policies).

SCOPE

The updated Master Plan includes the entire Cherry Creek Lake project. Past, current, and potential future impacts on natural, cultural, and manmade resources at the project are addressed. The primary area of influence on the Cherry Creek Lake project for socioeconomic factors and recreation needs is the Denver, Colorado, Primary Metropolitan Statistical Area (PMSA), which consists of Adams, Arapahoe, Denver, Douglas, and Jefferson Counties. The 1990 population of this area was 1,622,980, based on 1990 census data.

PROJECTWIDE RESOURCE OBJECTIVES

Resource objectives are realistically attainable goals for use, development, and management of natural and manmade resources at a specific project. They are guidelines for obtaining maximum public benefits while minimizing adverse impacts and protecting and enhancing environmental quality. They consider authorized project purposes, applicable Federal laws and directives, regional needs, resource capabilities, and expressed public desires. Specific resource objectives for the four land classifications identified for Cherry Creek Lake project lands owned in fee by the Government are found in chapter V. The projectwide resource objectives for the Cherry Creek Lake project are:

- To store and release Cherry Creek basin flows to facilitate their management for flood control, recreation, and fish and wildlife;

- To minimize lake-level fluctuations to reduce adverse impacts;

- To develop and manage project recreation lands to support types and levels of recreation use indicated by visitor demand and consistent with carrying capacity and esthetic and ecological values;

- To ensure that lands comprising at least 50 percent of the total project land and water acreage remain available to meet expressed regional low-density recreation needs and desires;

- To continue to restrict game field facilities to areas separated from the lake area by thoroughfares or the dam;

- To restrict siting of intensive recreation uses to areas that are adjacent to existing intensive recreation areas or are adjacent to the

project boundary, which keeps intact large blocks of open space and maintains the character of the SRA;

- To continue to provide for water-surface-use zoning which reduces user conflicts and increases safety while allowing for high levels of recreation use;

- To minimize adverse impacts to project resources from urban development in the Cherry Creek basin;

- To maximize the use of project lands for project purposes by encouraging off-project locations for transportation system improvements, utility lines and other jurisdictional facilities which do not directly or primarily support project functions or activities, and commercial recreation enterprises which do not require project lands or waters for successful operation;

- To maximize the recreational and esthetic values of the project to visitors;

- To manage and develop lands in cooperation and coordination with other management agencies;

- To achieve and maintain high standards of water quality and soil conservation;

- To maintain and manage the land and water resources to support a diversity of fish and wildlife; and

- To preserve, protect, and interpret threatened and endangered species and unique and important ecological, historical, archeological, and visual resources.

CHAPTER II

FACTORS INFLUENCING RESOURCE MANAGEMENT AND DEVELOPMENT

Many factors, varying in scope from regional to site-specific, influence use and development of the land and water resources at the Cherry Creek Lake project. The general physical characteristics of the region and the project area provide potential opportunities for resource use and development, but the opportunities that are realized are a product of human decisions.

Population growth in the Denver area has increased demands for use of a project resource base which has been gradually diminished by decreased water quality, increased erosion and sedimentation, some use of project lands for nonproject-related activities, and potential decreased lake surface area and depth from evaporative losses.

This chapter presents the characteristics of the existing resource base and analyzes its suitabilities and limitations for development, operation, and management of the project to meet expressed public needs and desires. These analyses are essential for developing a framework that maximizes diversity of opportunities for resource use, minimizes adverse impacts to the environment and to adjacent uses, and resolves competing and conflicting uses. The information presented in this chapter was used to assign land classifications, develop resource objectives for land classifications, and identify specific facility needs.

ACCESSIBILITY

ROAD ACCESS

Colorado is served by three major interstate highways which intersect at Denver. Interstate 25 (I-25) runs north-south through Colorado, parallelling the Front Range of the Rockies. Interstate 70 (I-70) is Colorado's major east-west thoroughfare, and Interstate 76 (I-76) follows the South Platte River from Denver into Nebraska, where it connects with Interstate 80 (I-80). These interstates are shown on plate 1.

Because approximately 84 percent of the visitors to the Cherry Creek Lake project are from Denver and Arapahoe Counties, accessibility of the project to local residents is important. Four major roads provide good accessibility to the project: Interstate 225 (I-225) on the north, I-25 on the west, Parker Road (State Highway 83) on the east, and Arapahoe Road (State Highway 88) on the south. The west entrance, the dam crest road, and Village Greens Park can all be accessed from the I-225/Yosemite Street interchange or the I-25/Belleview Avenue interchange. The east entrance and the dam crest road are accessed from Parker Road. J.F. Kennedy Park can be accessed from Parker Road or Hampden Avenue, which interchanges with I-25. Crestridge and Olympic Parks can be accessed from East Yale Avenue, which intersects with Parker Road, or by Iliff Avenue, which interchanges with I-225 and which is planned for upgrading to a major regional arterial. These and other local streets are shown on plate 4.

AIR ACCESS

Denver is a primary hub for the region's air travel and is within only 3 hours' flying time of 75 percent of the population of the United States. Of the six airports in the Denver PMSA, only Stapleton International Airport is classified as an air carrier. According to the State of Colorado Office of Economic Development, Stapleton Airport

ranks as the fifth busiest airport in the world because over 1,500 flights and almost 50,000 people pass through it daily. It is also considered as one of the easiest airports to enter and exit by vehicle.

Air travel is projected to rise 5 percent annually through the year 2000. Consequently, air travel through Colorado is expected to rise significantly. The City of Denver is planning to complete construction of a new air carrier airport to replace Stapleton Airport by the mid-1990's. The Federal Aviation Administration (FAA) projects that by the year 2000, this new airport will have approximately twice as many enplanements as Stapleton Airport had in 1988.

PUBLIC TRANSIT ACCESS

Denver is served by the Amtrak rail lines and Greyhound-Trailways bus lines. The Regional Transportation District (RTD) provides public transit within metropolitan Denver/Boulder. The RTD bus system serves developed portions of the region in a grid pattern and will provide access to and complement the proposed rapid transit system. The proposed rapid transit system is outlined in the "2010 Regional Transportation Plan," prepared by the Denver Regional Council of Governments (DRCOG). This system would have a hub in central Denver and seven transit corridors with 46 access points, or stations, radiating in all directions. One corridor is proposed for I-25, and a corridor linking Denver, Aurora, and the new airport may be sited along I-225. The RTD bus system would provide access to and complement the rapid transit system.

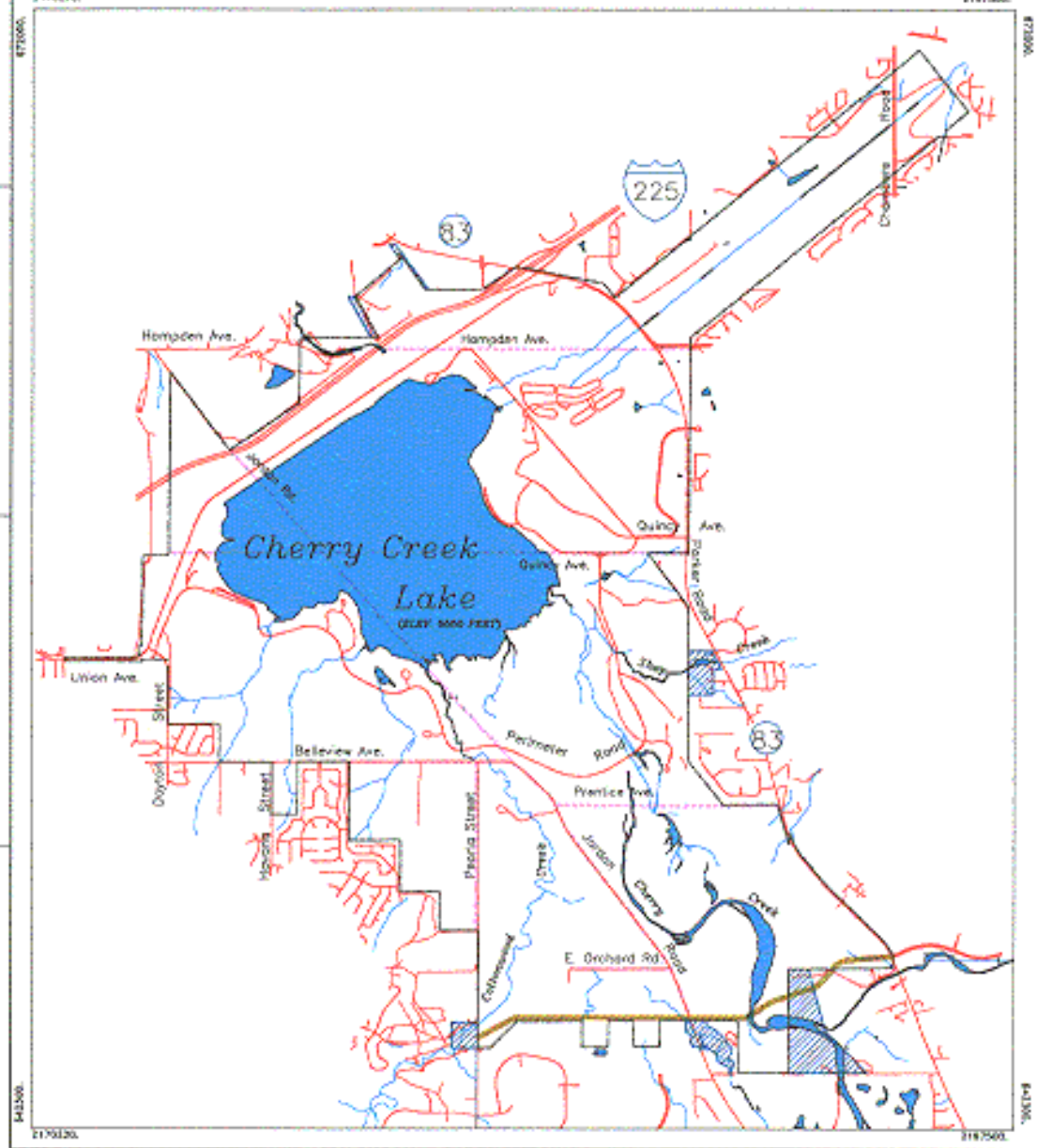
TRAIL ACCESS

The Cherry Creek Lake project can also be accessed from the Denver area bicycle and equestrian trail systems at several trail entrances. Additional connectors linking on-project and off-project trail systems are proposed for construction within 5 years.

SPECIAL CONSIDERATIONS

Segments of Jordan Road, Peoria Street, and Belleview Avenue traverse the project. These roads, which are maintained by Arapahoe County, isolate the southwest corner of the SRA.

To alleviate traffic congestion on the arterials surrounding the project, Arapahoe County is planning an alternate east-west route. A potential alignment of the proposed new route, referred to as the Cherry Creek crossing road, is shown in figure 2-1. It would run between Parker Road and Arapahoe Road and would be constructed partly on project lands near the southern boundary of the project east of Peoria Street. If the crossing road is constructed, Arapahoe County proposes that the portions of Jordan Road and Peoria Street and most segments of Belleview Avenue located on project lands be closed to through traffic and that a new off-project road, connecting Peoria Street with Cherry Creek Drive, be constructed to provide alternative access. This proposal is discussed further in the Real Estate section of chapter II and in chapter III.



MAP LEGEND

- WATER BODIES, STREAMS
- PERMANENT EASEMENTS
- ROADS
- PROPOSED CROSSING ROAD
- ARAPAHOE CO. RIGHT-OF-WAY
- PROJECT BOUNDARY

U.S.ARMY
CORPS OF
ENGINEERS

SCALE IN FEET

--- THINK VALUE ENGINEERING ---

CHERRY CREEK LAKE
MASTER PLAN
POTENTIAL CROSSING ROAD AND
ARAPAHOE CO. RIGHTS-OF-WAY
FIGURE 2-1

CLIMATE

The climate of the Denver area is semiarid and is nearly ideal for outdoor recreation. Sunshine is abundant, temperatures are relatively moderate, and precipitation and relative humidity are generally low. Rapid changes in weather, however, are common and greatly influence recreation activities.

TEMPERATURE

Temperatures in the Denver area can vary widely from day to day because of the invasion of large air masses from the north or south, and rapid warmups during the winter months are not uncommon because of the effects of Chinook winds. The hottest month of the year is July, when daily maximum temperatures average 88 degrees Fahrenheit (°F) and rarely exceed 100 °F. The coldest month of the year is January, when daily minimum temperatures average 14 °F and rarely fall below 0 °F. The length of the frost-free period is approximately 165 days, several weeks longer than it is outside of the Denver urbanized area because of the effects of the urban heat island. The mean date of last freeze is May 2 and the mean date of first freeze is October 14. Monthly temperature ranges are presented in table 2-1.

PRECIPITATION

Precipitation patterns are shown in table 2-1. The average annual precipitation at the Cherry Creek Lake project is over 16 inches, most of which occurs as rain during the months of April through August. There is a 20-percent probability each year that the Denver area will have less than 9 inches of precipitation and a 20-percent probability each year that more than 18 inches of precipitation will be recorded. Thunderstorms, hailstorms, windstorms, and tornadoes are most frequent between May 15 and September 1. Mean relative humidity in July declines from 67 percent at 7 a.m. to only 32 percent at 1 p.m., then rises slightly to 34 percent at 7 p.m.

Table 2-1
Temperature and Precipitation
Denver, Colorado

Month	Normal Daily[1] Minimum (°F)	Normal[1] Daily Mean (°F)	Normal Daily[1] Maximum (°F)	Average[2] Monthly Precip. (Inches)	Average[3] Days of Snow Cover
Jan.	15	29	42	0.47	8
Feb.	18	32	45	0.53	9
March	23	36	50	1.18	7
April	32	46	61	1.74	3
May	42	56	71	2.79	1
June	51	67	82	2.13	0
July	57	73	88	2.15	0
Aug.	56	72	87	1.86	0
Sep.	47	63	79	1.21	0
Oct.	36	51	67	1.01	1
Nov.	24	38	52	0.89	5
Dec.	18	32	45	0.56	7
TOTAL				16.52	41

[1] Temperature data were recorded at Stapleton Airport, Denver, Colorado, between 1931 and 1960. Climatic Atlas of the United States, U.S. Department of Commerce, 1974.

[2] Precipitation data were recorded at the Cherry Creek Lake project weather station between 1948 and 1983.

[3] Snow data were recorded at Byers, Colorado, which usually receives slightly less precipitation than Denver. Soil Survey of Arapahoe County, Colorado, Soil Conservation Service, March 1971.

The largest amount of snow falls in January and February. There are an average of 41 days with snow cover per year, and the average snow depth is 3 inches. Cherry Creek Lake usually remains frozen to a depth sufficient to support ice fishing and ice skating for at least 60 days.

WIND

Wind speeds are generally low to moderate. Monthly average wind speeds range from 9 to 11 miles per hour (m.p.h.), and the yearly average is 10 m.p.h. However, occasional wind gusts exceeding 50 m.p.h. do occur. Prevailing winds during each month are from the south or

south-southwest. During the winter, winds blowing from the north and northwest are generally colder than those blowing from the south. Chinook winds, which blow from the west and are warmed as they descend to the plains east of the Rocky Mountains, are also an important climatic factor. The arrival of a Chinook wind can cause temperatures in the Cherry Creek Lake vicinity to suddenly increase by several degrees. Wind roses for the Denver area are presented in figure 2-2.

GENERAL IMPACTS

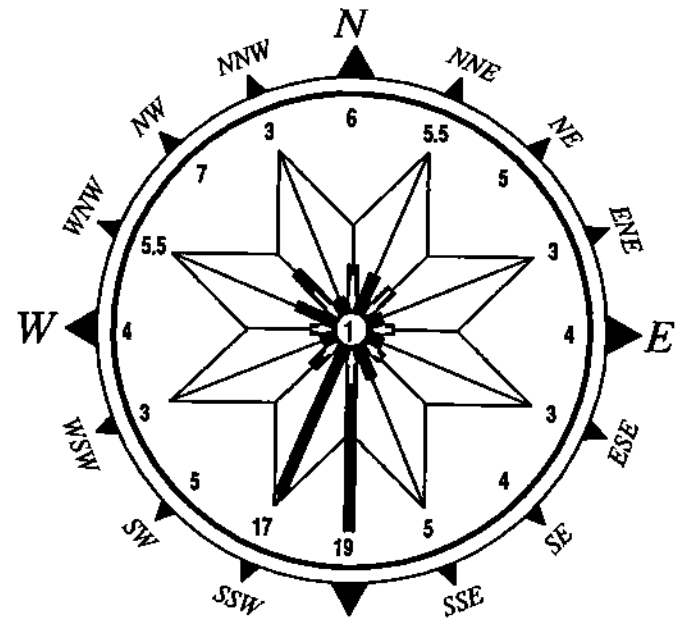
Low precipitation and high summer temperatures inhibit the establishment and growth of grass and trees. This situation is worsened by the heavy foot traffic received by many areas of Cherry Creek Lake. Installation of irrigation and turf grass in areas experiencing heavy foot traffic may be necessary to maintain vegetative cover and prevent erosion of soil by wind and water.

Trees and shrubs are important microclimate modifiers, providing shade and protection from the wind. However, they grow only where soil moisture is adequate. Additional plantings are needed in areas where they might naturally be found (along drainages or along the lakeshore) and in intensive recreation areas. Appropriate plantings will add to human comfort and enjoyment of the area and provide wildlife habitat. These plantings are discussed in the Biological Resources section of chapter II and in chapter VI.

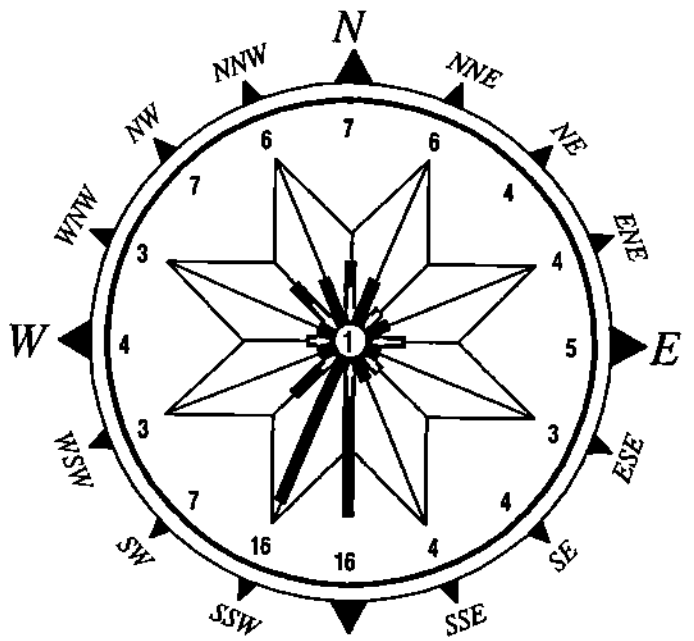
Wide seasonal variations in temperature increase the variety of activities which can take place at Cherry Creek Lake during the course of a year. However, the variability of day-to-day temperatures within a season creates some problems. The common occurrence of freezing temperatures in April, May, and September make heated rest rooms and winterized water lines desirable. Variations in annual snowfall and winter temperatures result in fluctuations in winter sports participation and make planning for winter sports festivals difficult.

FIGURE 2-2

SURFACE WIND ROSES - DENVER, COLORADO



January



July

Source: Climatic Atlas of the United States, U.S. Department of Commerce, 1974. Based on hourly observations 1951-1960. Values at end of each bar indicate the percent of time wind is from given direction. Percent of calm shown in center circle.

The winds are adequate to provide for safe and enjoyable sailing and sailboarding. The sailboard beach and west boat ramp were sited to take advantage of the prevailing southerly and south-southwesterly winds. Because of the prevailing wind direction, few sailboats are launched from the east boat ramp. Sudden storms with gusty winds may occur, affecting boaters and swimmers. Another wind-related problem is shoreline erosion, the majority of which has resulted from wind-driven waves.

TOPOGRAPHY, HYDROLOGY, AND GEOLOGY

TOPOGRAPHY

Cherry Creek Dam lies within the Colorado Piedmont Section of the Great Plains Physiographic Province. The general topography of this section consists of flat tablelands separated by flat-bottomed valleys. The South Platte River, of which Cherry Creek is a tributary, flows northeastward through this section. Elevations for most of the Denver area are less than 6000 feet m.s.l., but the Rocky Mountain foothills rise as hogbacks immediately west of Denver. The high peaks of the Rocky Mountains west of the hogbacks exceed 14,000 feet m.s.l.

The topography immediately adjacent to the reservoir is characterized by a 3,000-foot-wide valley separating hills which rise 200 feet above the former valley floor. Slopes on the valley walls occasionally exceed 10 percent, but most slopes do not exceed 3 percent. Gentler slopes are found on the surrounding tablelands.

HYDROLOGY

Cherry Creek is a right-bank tributary of the South Platte River. It enters the South Platte River in the highly developed business and industrial area of downtown Denver. The basin drains a 410-square-mile area located south of Denver. Cherry Creek Dam is located about 11.4 miles upstream from the mouth of Cherry Creek and controls 385 square miles of the basin's drainage area. The length of the basin is about 57 miles and the average width is about 11 miles.

The Cherry Creek basin upstream from Franktown has steep to moderately rolling topography. A narrow belt across the central part of the basin, immediately upstream from Franktown, is characterized by sharp topographic relief. Canyon walls and mesa fronts, 200 to 400 feet high, are common in this belt. In the reach from near Franktown to near Parker, Cherry Creek courses through a broad valley bordered by steep to

rolling ridges and hills. Downstream from Parker, the upland area consists of rolling hills. The basin elevation varies from about 7700 feet m.s.l. at the source of Cherry Creek to about 5170 feet m.s.l. at its confluence with the South Platte River.

GEOLOGY

Bedrock. The bedrock below Cherry Creek Lake and the surrounding hills is the Denver Formation of late Cretaceous and early Tertiary age. The Denver Formation overlies a 10,000-foot-thick sequence of Cretaceous to Paleozoic sedimentary rocks filling the Denver basin. The Denver Formation is composed of alternating strata of shale, claystone, siltstone, sandstone, and some conglomerate. These units have been described as being thin-bedded, semiconsolidated to consolidated, and friable. The bedrock has relatively low permeability compared to the alluvial valley fill because of significant clay and silt content in most layers. Bedrock is encountered from 5 to over 100 feet below the surface. The bedding in the Denver Formation is nearly horizontal and has not undergone significant folding. The bedrock is considered stable because of the lack of deep-seated slumping. No significant faulting is apparent in the Denver Formation near the damsite; however, significant faults which were last active more than 500,000 years ago have been found to cut older bedrock near the mountain front and in the foothills. Seismic analyses indicate that peak horizontal ground accelerations in the vicinity of Cherry Creek reservoir caused by maximum postulated earthquakes on faults in central Colorado are approximately 15 percent of the acceleration of gravity. Based on an initial analysis contained in the 1988 draft DM CC-13, Seismic Evaluation, Cherry Creek Lake, Colorado, this does not pose a significant risk to the dam.

Alluvium. The Cherry Creek valley is underlain by alluvial sand and gravel and some layers of fat to lean clay. This valley-fill alluvium is generally about 40 feet thick but exceeds 100 feet in buried ancient channels. Hillslopes are usually covered by weathered Denver Formation deposits but sometimes by Holocene to Pleistocene windblown sand or

loess. These deposits generally range from clayey sandy silt to silty or clean sand. Deposits of Pleistocene-age Slocum and Louviers alluvium, much older than the valley-fill alluvium, have been mapped on the northeast side of the reservoir well above the former stream level. These deposits were derived from the mountains to the west and south of the reservoir and consist of clayey to silty sand containing some gravel and cobbles.

Mineral Resources. Mineral resources may be present in strata near the reservoir. Some low-grade coal may be present in certain shallow bedrock units, and oil and natural gas are produced from deep bedrock units elsewhere near Denver. Sand and gravel are present in the valley-fill alluvium. The Omaha District knows of no plans to exploit mineral resources on Cherry Creek project lands.

Ground Water. Several aquifers lie beneath the Cherry Creek Lake project. From the deepest to the shallowest, these are the Laramie/Fox Hills aquifer, the Arapahoe aquifer, the Denver bedrock aquifers, and the alluvial aquifer in the Cherry Creek valley.

The Laramie/Fox Hills aquifer is found at depths exceeding 2,000 feet at Cherry Creek Lake. The artesian pressure of the aquifer would result in a static water level in a well only a few hundred feet below the surface. Water quality of this aquifer is generally good, with total dissolved solids less than 200 parts per million (p.p.m.) and low hardness. Yields are generally good from this aquifer, and wells producing from it could yield hundreds of gallons per minute (g.p.m.).

The Arapahoe aquifer is significantly shallower than the Laramie/Fox Hills aquifer and lies approximately 900 to 1,000 feet below Cherry Creek Lake. Static water levels in wells tapping the Arapahoe aquifer would be only 200 to 300 feet below ground surface. Water from the Arapahoe aquifer near the lake is generally soft and low in dissolved

solids (less than 200 p.p.m.). Yields from this aquifer would likely be in the range of several hundred g.p.m.

The Denver aquifer is the shallowest bedrock aquifer. Water levels are generally less than 200 feet below the surface, but yields are poor compared to the deeper aquifers. Water quality is fairly good, with dissolved solids usually less than 400 p.p.m. and low hardness.

The alluvium of the Cherry Creek valley is the shallowest aquifer in the vicinity of the dam, but it would generally be unavailable to wells upstream from the dam because of the presence of the reservoir. Given the coarse nature of the alluvium, yields from wells upstream from the reservoir should be good. The quality of the water from the alluvium is not known but would be expected to be somewhat poorer than the water from the deeper bedrock aquifers because of its surface origins in an urban area.

GENERAL IMPACTS

Land classifications and recreation facility siting are influenced by the topography, hydrology, and geology of the area. Geology will affect the soil conditions and shoreline stability near the reservoir, but no unusual problems directly related to the geology of the Cherry Creek Lake area are anticipated. Well water is a viable alternative to municipal water at the Cherry Creek Lake project. There should be no problem obtaining an adequate supply from wells, although a considerable expense may be incurred if the necessary yield requires a deep well. The protection of ground water should be a consideration in evaluating the impacts of proposed development.

SOILS

Soil is produced by the action of soil-forming processes on parent material that was deposited or accumulated by geologic forces. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material accumulated and weathered; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time the forces of soil development have acted on the soil material.

Differences in these soil formation factors result in different soil characteristics. Soils which have similar profiles (sequence of natural layers) are classified by the U.S. Soil Conservation Service (SCS) as belonging to the same soil series. Some soils are so rocky, shallow, or eroded that they cannot be classified by soil series; these are called land types. Two or more soil series or land types are combined to form a soil association, which is a group of soils geographically associated in a characteristic pattern. The four soil associations and three land types found within the Cherry Creek Lake project are described below. This information is presented for general planning and management purposes rather than as a basis for making decisions on specific tracts of land.

SOIL CHARACTERISTICS

Alluvial Land-Nunn Association. This soil association consists of deep, nearly level, mainly loamy and sandy soils which have recently been deposited along major streams. This soil association is found in the flood plains of Cherry Creek and Cottonwood Creek and is well suited for wildlife habitat.

Wet alluvial land occupies nearly level areas next to stream channels and is usually flooded each spring. The soil material occurs

in thin layers ranging from loam to sand and may accumulate up to 4 feet in thickness. It is usually wet below a depth of 3 feet and often wet at the surface. It is well suited to grasses and wetlands vegetation; cottonwoods and willows are common.

Sandy alluvial land is located adjacent to or in major stream channels and is frequently flooded. It has potential for droughtiness because of rapid drainage and coarse texture. It is also susceptible to erosion by water or wind. These factors result in severe limitations for landscape plantings.

Loamy alluvial land is found in creek bottom areas which are usually dry. A high seasonal water table, severe water erosion, and occasional flooding cause this land type to have limitations for most types of development, but it is well suited for recreation areas, landscape planting, and wetlands development.

Nunn soils have a loamy surface layer and a clay loam or clay subsoil. Because these soils occur on terraces, they are not often flooded. Nunn soils are susceptible to wind erosion if not vegetated. They are well suited for recreation areas and landscape plantings.

Renohill-Buick-Litle Association. This soil association, which consists of moderately deep soils with a loamy surface layer from 3 to 5 inches deep and a loamy to clayey subsoil which extends to a depth of about 22 inches, occurs over shale or sandstone. Renohill and Buick soils are found mainly on uplands west of the Cherry Creek streambed; Litle soils are not present on project lands. Slopes range from 5 to 25 percent.

Renohill and Buick soils are moderately permeable at best. Runoff generally is moderate to rapid. Erosion by water is normally slight, but it is severe in some disturbed areas. Renohill soils are also subject to erosion by wind. Therefore, these soils have severe

limitations for recreation areas with heavy foot traffic, such as picnic and sports areas. High-swelling clays in Renohill and Buick soils and the fact that shale may lie only 22 inches below the surface of Renohill soils cause severe limitations for foundations for small buildings and septic tank absorption fields.

On Renohill and Buick soils, growth of broad-leaved trees and shrubs is poor to fair and growth of evergreens is fair. However, their growth is good to fair in the drainageways and in the small areas that consist of deep, gently sloping soils. In most areas, Renohill and Buick soils are moderately well suited for wildlife habitat.

Truckton-Bresser Association. The Truckton-Bresser association consists of deep soils with a loamy and sandy surface layer from 5 to 6 inches deep and a loamy subsoil which may extend to a depth of 30 inches. This soil association occurs on uplands; most of the upland soils on the project east of the Cherry Creek bottomlands and the lake belong to this soil association. These soils formed in noncalcareous, sandy material deposited by wind. The topography is rolling; most slopes are from 3 to 8 percent.

The sandy texture makes Truckton and Bresser soils susceptible to wind erosion. However, available water-holding capacity is moderate, and broad-leaved trees, evergreens, and shrubs grow well. In areas without vegetative cover, the soil surface may form a crust when dry, reducing the infiltration rate and increasing the potential for water erosion. This causes moderate limitations for recreation areas with heavy foot traffic such as picnic areas and campsites. However, these soils are well suited to most other types of development and provide good wildlife food and cover.

Fondis-Weld Association. The Fondis-Weld association consists of deep, nearly level and gently sloping loamy soils that have a clayey layer in the subsoil. Soils in this association are formed mainly in

silty wind-deposited material. This association occurs on uplands in the western part of the Cherry Creek Lake project. Slopes usually range from 1 to 5 percent but may be 9 percent next to drainageways.

A moderate infiltration rate, high available water-holding capacity, and high natural fertility make Fondis and Weld soils well suited for landscape plantings. The growth of broad-leaved trees and shrubs is poor to fair and the growth of evergreens is fair. However, the siltiness of Fondis and Weld soils makes them susceptible to erosion by water or wind, which results in severe limitations for recreation areas with heavy foot traffic.

Fondis soils have a surface layer of silt loam to silty clay loam about 8 inches deep with a clay and silty clay loam subsoil extending to a depth of about 32 inches. High-swelling clays and the presence of salts below a depth of 8 inches in Fondis soils result in severe limitations for foundations for small buildings and septic tank absorption fields.

Weld soils have a silt loam surface layer about 5 inches deep and a subsoil of clay loam, silty clay, and silty clay loam about 21 inches thick. Liquefaction is a limiting factor.

Gravelly Land. This land type occurs on side slopes above Cottonwood Creek. The slopes range from 6 to 50 percent. The soil profile is variable, but the surface layer is commonly sandy loam or gravelly loam from 2 to 4 inches deep. It is underlain by 10 to 20 inches of material that is usually sandy loam or gravelly clay loam. Gravel mixed with some silt and sand occur below a depth of 3 feet. Shale and sandstone often crop out on the lower side slopes.

The gravelly and sandy soils absorb water rapidly, have low available water-holding capacity, and are highly susceptible to wind erosion. The clayey soils absorb water slowly, but large amounts are

lost through runoff. Water erosion is a severe hazard. In general, gravelly land has severe limitations for landscape plantings. This land type mainly supports native grasses and shrubs. A protective cover of vegetation is needed at all times to control erosion by water and wind. Planting trees and shrubs is not practical on gravelly land because these soils are too steep, shallow, saline, alkaline, and/or have a high or fluctuating water table or inadequate moisture content.

Rock Outcrop. In areas of this land type, the soils have been stripped so that interbedded shale and sandstone are exposed at the surface. Rock outcrop lands are sloping to nearly level and are found on the west side of the lake, from the dam to the sailboard beach. The soil varies in color and texture but normally is olive clay loam. It is hard and platy and resists penetration of water. Erosion by wind and water are severe hazards.

The shallow depth to bedrock has limited the success of the tree planting program on the west side of the lake. Hardy tree and shrub species can be planted in small areas of deeper soils along the drainageways and in isolated pockets.

Sandpits. Sandpits are open excavations that are several feet deep and 20 acres or more in size. Pale-brown sand is visible at the border of these pits. This land type occurs in nearly level areas on the east side of the lake. Sandpits are very low in natural fertility and are highly susceptible to wind erosion and occasional flooding; these characteristics cause severe limitations for landscape plantings. This land is well suited for the beaches and foundations of small buildings developed in this area of the project.

GENERAL IMPACTS

Soils found within the Cherry Creek Lake project vary in their suitability or limitations for particular uses. Potential problems posed by soils for a particular kind or level of development must be

identified during the early stages of planning so that recreation areas, roads, and structures can be properly sited; vegetative plantings will contain appropriate species and employ special planting techniques if needed; and the proper type and location of the waste disposal system can be selected. Detailed information on locations, characteristics, suitabilities, and limitations of specific mapping units within each soil series or land type is included in the "Soil Survey, Arapahoe County, Colorado", published in March 1971 by the U.S. Department of Agriculture in cooperation with the Colorado Agricultural Experiment Station.

Problems of soil erosion and alluvial deposition are addressed in later sections of chapter II.

SEDIMENTATION

Sedimentation occurs when particles suspended in Cherry Creek Lake fall out of suspension. Sedimentation rates are taken into account in determining the useful life of the reservoir for purposes other than flood control. The major sedimentation processes occurring in Cherry Creek Lake are sediment deposition, delta encroachment, and littoral drift.

SEDIMENT DEPOSITION

The major source of sediment inflow to Cherry Creek Lake is from two intermittent streams, Cherry Creek and Cottonwood Creek. Storm events result in high inflows, which carry large sediment loads. Because high inflows are sporadic, sediment deposition does not occur at an even rate. Between 1950 and 1988, the average annual rate of sediment deposition in the reservoir (below the multipurpose pool) was 61 acre-feet. The rate of depletion of storage capacity caused by sediment deposition at Cherry Creek Lake during different time periods is shown in table 2-2.

Table 2-2
Rate of Sediment Deposition Above and Below Multipurpose Pool
Cherry Creek Lake, 1957-1988

	Above Elevation 5550 ft. m.s.l.			Below Elevation 5550 ft. m.s.l.		
Survey (year)	Capacity Lost (AF)[1/]	Depletion Rate Between Surveys (AF/YR)[2/]	Depletion Rate Since Closure (AF/YR)	Capacity Lost (AF)	Depletion Rate Between Surveys (AF/YR)	Depletion Rate Since Closure (AF/YR)
1957	--			--		0
		236			148	
1965	1,890		236	1,180		148
		41			82	
1974	366		133	734		113
		22			30	
1988	311		83	421		75

[1/] Acre-feet
[2/] Acre-feet per year

A large volume of sediment was deposited during the 1965 flood; afterwards, the rate of sediment deposition decreased significantly because of the absence of flooding. Almost 48 percent of the sediment deposition since 1957 has occurred below the multipurpose pool elevation of 5550 feet m.s.l. Sediment range survey data indicate that an appreciable amount of sediment depth has accumulated, particularly in the former Cherry Creek channel near the dam. Fortunately, survey data also indicate a relatively insignificant loss of water depth through the main reservoir area and a significant decrease in the rate of sediment deposition in recent years. The average depth of the lake at the multipurpose pool elevation of 5550 feet m.s.l. is approximately 20 to 25 feet in the downstream 5,000 feet of the reservoir. Upstream from that point, depths decrease rather quickly as the active delta reach is approached.

In the future, the percentage of sediment deposited annually below the multipurpose pool level is expected to increase gradually to 80 percent. The long-term deposition rate below elevation 5550 feet m.s.l. is projected to be 120 acre-feet per year. Based on this rate, a multipurpose pool elevation of 5550 feet m.s.l., and an allowance of 5 feet of water depth for boating clearance, the Cherry Creek Lake is projected to have a useful life for boating of over 100 years since impoundment in 1957.

DELTA ENCROACHMENT

As Cherry and Cottonwood Creeks enter the reservoir, stream velocities slow and transported sediment particles begin to fall out. The heavier particles settle out first, followed by progressively lighter particles--sand, then silt, and finally clay--thus forming the delta. This delta reach has taken on a marshy appearance, characterized by shallow depths, mudflats, and a proliferation of willows and cattails.

LITTORAL DRIFT

Alongshore currents resulting from wind and/or motorboats in Cherry Creek Lake transport sediment that can be deposited to form a littoral bar across the boat ramps, obstructing their use. The west boat ramp and the northern east boat ramp have apparently experienced this problem.

IMPACTS AND CONCERNS

Sedimentation is a natural consequence of reservoir construction and is an ever-present factor in resource use planning at reservoir projects. Sedimentation can present hazards to boaters, impair fisheries, and jeopardize recreation facilities. Sedimentation can affect operation and maintenance costs and limit the useful life of the lake. For example, it has necessitated boat ramp rehabilitation and replacement by the local sponsor and flushing operations by the Corps to prevent sediment accumulation at the intake structure from precluding closure of the emergency gates.

The State of Colorado has expressed concern over the potential impact of sedimentation on water-based recreation at Cherry Creek Lake. The State feels that excessive sedimentation has occurred on all sides of the lake, with the most severe problem on the east side. Sediment deposits necessitated construction of a new boat ramp on the west side of the lake in 1989. To minimize the impact of littoral deposits on recreation on the east side of the lake, the DPOR plans to relocate the northern east boat ramp.

The State of Colorado installed a number of small culverts under the perimeter road where it crosses Cherry Creek. The staggered elevation of these culverts has resulted in only a few small culverts accommodating Cherry Creek flows at any one time. Deposition of sediment has resulted in plugging of many culverts and elevation of the Cherry Creek bed upstream from the perimeter road. Trapped sediments sometimes cause Cherry Creek to overtop the perimeter road during storm

events. Because of deposition, these sediments have been prevented from entering Cherry Creek Lake. Removal of these stream deposits is impractical in most areas because of dense tree and shrub growth. When the next major Cherry Creek flood occurs, much of the trapped sediment may be flushed into the lake by the floodwaters. To minimize sediment inflows into the lake from Cherry Creek, the Cherry Creek Basin Water Quality Authority (CCBWQA) is considering construction of sediment traps in the Cherry Creek channel upstream from the lake as part of its "Evaluation of In-Reservoir Control Options" for improvement of water quality in the lake. The CCBWQA investigations are discussed in more detail in the Water Quality section in chapter II.

The establishment of wetlands vegetation is recommended as a method of delta stabilization. Sediments in the delta area of the lake are commonly resuspended by wind-wave action and are distributed throughout the remainder of the reservoir. Planting of rooted aquatic species would stabilize the delta in this area, would inhibit resuspension of the sediments, and would benefit wildlife. This method is being considered by the CCBWQA as part of its "Evaluation of In-Reservoir Control Options" for improvement of water quality in the lake. Prior to stabilization of the delta by vegetative plantings, it is recommended that some shallow areas in the delta be deepened by dredging to create some open-water areas. These actions would increase habitat for aquatic birds. It could also reduce mosquito breeding areas in the delta if excavated slopes were steep enough to provide open water and wave action; shallow excavations could aggravate mosquito problems.

Solutions to the problem of littoral deposition need to be researched. The DPOR is currently investigating the littoral deposition in the vicinity of the northern east boat ramp. The CCBWQA is also studying the effects of sedimentation.

RESERVOIR REGULATION

The current plan for reservoir regulation is based on the top of the multipurpose pool being at elevation 5550.0 feet m.s.l. with a 1-foot operational zone up to elevation 5551.0 feet m.s.l. The 1-foot zone, which was originally implemented to allow some operational flexibility because of the large outlet gates, is currently being maintained to facilitate sediment flushing operations.

When the pool elevation of Cherry Creek Reservoir rises above 5550 feet m.s.l.--and it appears that it will continue to rise--releases for flood control are determined by the Water Control Section, Hydrologic Engineering Branch, Engineering Division of the Omaha District, based on a coordinated Tri-Lakes plan. This plan requires that releases from Chatfield, Bear Creek, and Cherry Creek Reservoirs be scheduled to keep a gage height at Henderson, Colorado, at or below 7.5 feet (approximate discharge of 5,500 cubic feet per second (c.f.s.)), if possible, even though flood stage is 10.0 feet (approximate discharge 11,500 c.f.s.). This type of operation leaves some stream capacity at Henderson for the uncontrolled runoff below the reservoirs.

The original maximum design pool for the IDF at Cherry Creek Reservoir was at elevation 5636.2 feet m.s.l. Studies completed recently based on new criteria for the IDF indicate that the maximum pool for the IDF would be higher than the top of the embankment, which is at elevation 5644.5 feet m.s.l. The maximum pool of record occurred on 3 June 1973 and was 5565.8 feet m.s.l. After the multipurpose pool was initially reached in 1960, the lowest pool of record occurred on 29 January 1965 and was 5543.5 feet m.s.l. The maximum daily release from the project was 560 c.f.s. on 7-8 August 1965. During the annual sediment flushing operation, releases will fluctuate up to 800 c.f.s. for short periods of time. Based on the reservoir regulation plan, releases from Cherry Creek Reservoir for flood control could reach 5,000 c.f.s. during a major flood event. The Area Curve and Capacity Curve

for Cherry Creek Reservoir are presented as figures 2-3 and 2-4, respectively. They are based on surveys taken in June 1988 and were compiled in August 1988.

Surface water rights in Colorado are based on seniority of established claim. The Colorado DPOR holds two water rights for storage in the Cherry Creek Reservoir. The first, with an appropriation date of 5 May 1958, is for 10,000 acre-feet; the second, with an appropriation date of 22 March 1960, is for an additional 5,580 acre-feet. Both were adjudicated on 18 May 1972, and are sufficiently junior that almost any call on the South Platte River below Cherry Creek will affect the reservoir if there is a flow in Cherry Creek.

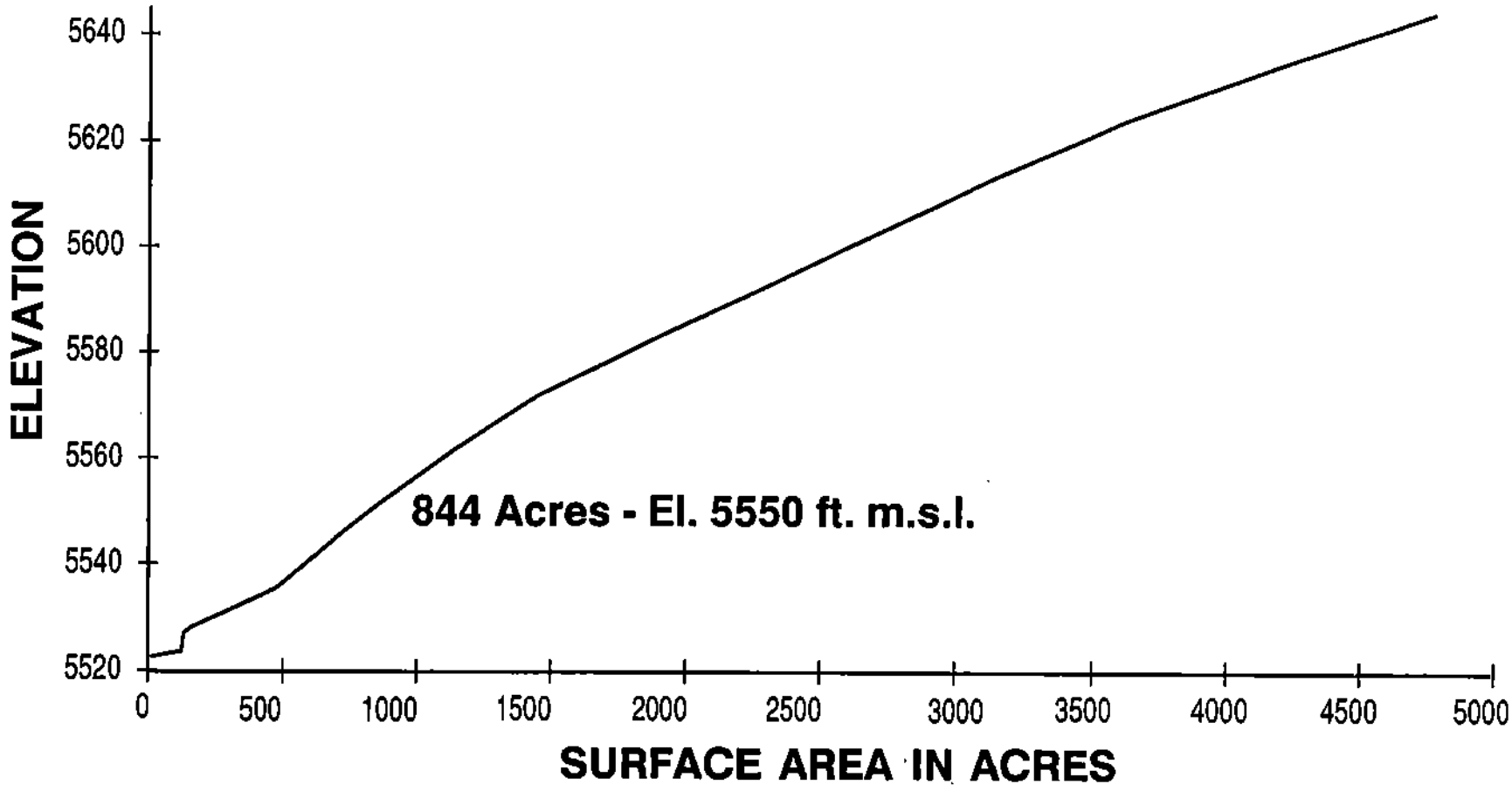
The reservoir regulation plan for Cherry Creek requires that inflows be released from the project when there is a call on the South Platte River that affects the Cherry Creek basin. The majority of the calls occur during the irrigation season, which typically runs from April 1 through October 15. When such a call is in effect, water users junior to the call may not divert water. For Cherry Creek Reservoir, an onstream lake, this means that inflows must be passed through the reservoir.

On 1 April 1988, the State of Colorado Division of Water Resources implemented strict administration of water rights within the Cherry Creek basin as a result of written demands from downstream senior water users. Currently, when Cherry Creek Reservoir's water rights are junior to a call, releases equal to inflows must be made. Evaporation could cause the water level in the lake to be lowered by as much as 2 feet from the previous year's pool elevation; the gross average annual historic lake evaporation, based on recorded pan evaporation at Cherry Creek Reservoir from 1959 to 1985, exceeds the average annual precipitation by approximately 2 feet.

Prior to 1 April 1988, when Cherry Creek Reservoir's water rights were junior to a call, evaporation losses were not released to the river

FIGURE 2-3

CHERRY CREEK RESERVOIR - AREA CURVE



CHERRY CREEK RESERVOIR - CAPACITY CURVE

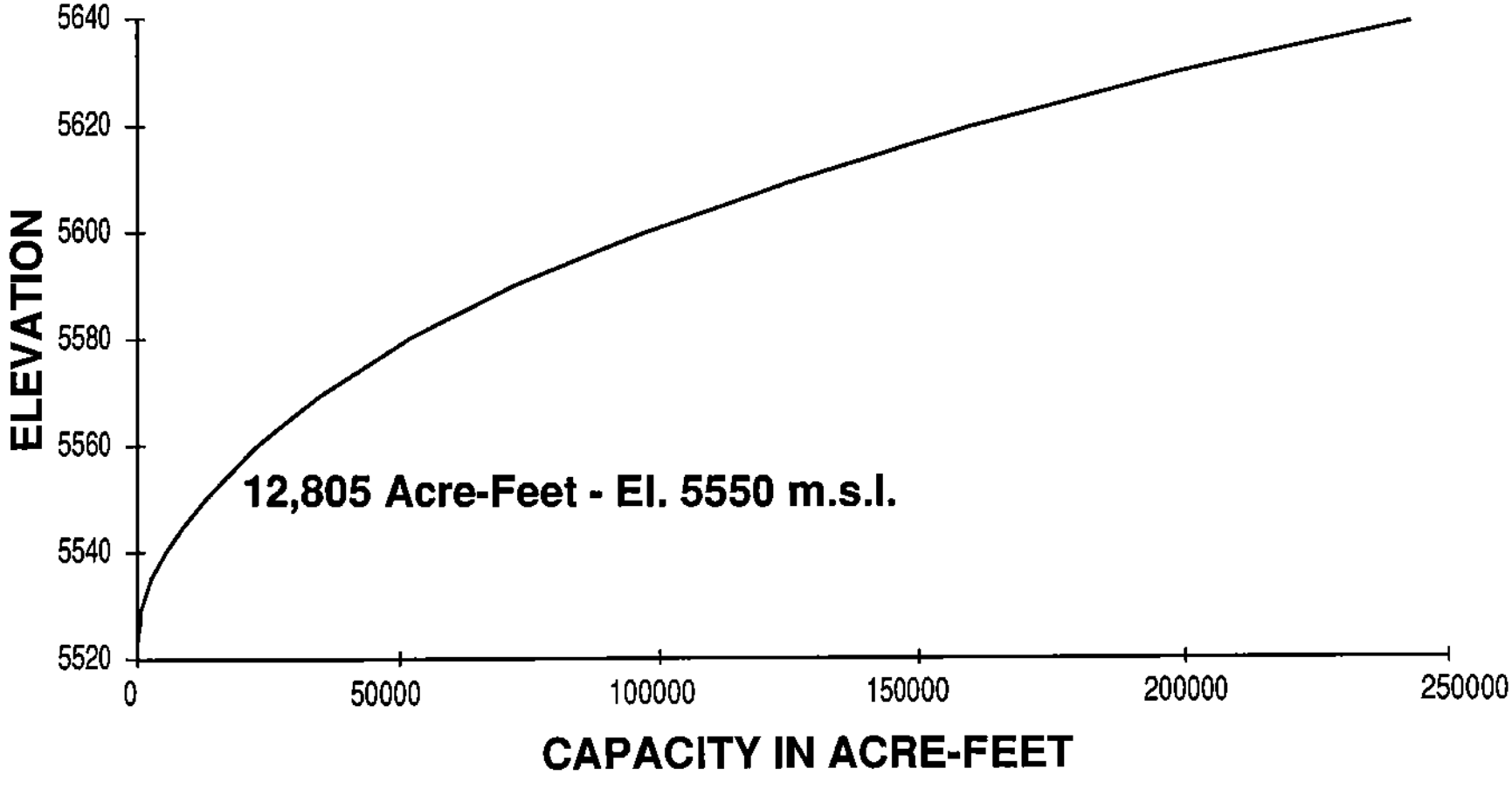


FIGURE 2-4

because of the inability of reservoir flows to maintain the multipurpose pool. A report prepared for the DPOR by the Colorado Water Conservation Board determined that the water level in Cherry Creek Lake would have dropped as low as 5542 feet m.s.l., 8 feet below the current multipurpose pool level, in the years 1977 through 1983 under strict water-rights administration. The DPOR is investigating methods of supplementing the water in Cherry Creek Lake to maintain current recreation opportunities at the SRA.

The outlet gate configuration at the project consists of five 6- by 9-foot hydraulic gates and two 18-inch bypass gates. The minimum practical release from the 6-foot gates is approximately 50 c.f.s. This minimum release rate is too large for passing water-rights releases. In November 1988, the Corps modified two of the outlet gates by adding an 18-inch bypass gate which allows releases as low as 3 c.f.s. To minimize the number of gate changes, the Water Control Section will compute the daily inflows and order gate changes based on the weekly average. Tight accounting procedures are maintained by the Colorado Division I Engineer to ensure compliance with State water laws.

SPILLWAY FUNCTION

The Cherry Creek spillway is a limited service spillway. It is designed to operate very infrequently and with the knowledge that some degree of damage or erosion will occur during operation. Spillway capacity and performance must be maintained throughout the life of the project. Because obstructions in the spillway or spillway entrance can cause overtopping and failure of the dam embankment and because excessive erosion can cause failure of the spillway, it is imperative that actions are not permitted that may either cause erosion or obstruct flows in the emergency spillway channel, its entrance, or its exit.

The spillway is separated into three main areas: the spillway entrance, the spillway channel, and the spillway exit. The spillway entrance is defined as the area leading from the reservoir to the upstream end of the spillway crest. The spillway crest is designed as the point of control for spillway releases and is set at an elevation where spillway flow must begin to occur to ensure that the dam embankment will not be overtopped. The spillway channel is defined as the excavated area necessary to allow passage of flood flows around the dam embankment. The spillway channel extends from the upstream end of the spillway crest to the downstream portion of the excavated channel area. The spillway exit is the area between the downstream end of the excavated spillway channel and the flood plain of the natural channel downstream from the spillway outlet. The spillway entrance, channel, and exit are delineated on plate 5.

Specific limitations to the three delineated areas are as follows:

- Spillway Entrance - No construction which acts as an obstruction to flow or which has a negative impact on flow distribution will be allowed in the spillway entrance. Items specifically prohibited in the excavated portion of the spillway entrance are fences, trees, shrubs,

posts, grills, buildings, ditches, and fill areas. In the area between the normal reservoir pool and the excavated portion of the spillway entrance, some obstructions will be permitted if the top of the obstruction does not project above the spillway crest elevation (5598 feet m.s.l.). For example, picnic shelters or toilet facilities may be permitted if the top of the roof does not project above the spillway crest elevation. Any trees or shrubs planted in this area must be selected and placed such that the maximum mature height of the tree or shrub is not above the spillway crest elevation. An illustration of this concept is presented on figure 2-5. If a road or trail is constructed in the spillway entrance area, it must not go through the excavated portion of the spillway entrance, the spillway channel, or the spillway exit.

- Spillway Channel - No construction of any kind will be allowed in the spillway channel or on the side slopes of the spillway channel. Items specifically prohibited in the spillway channel are trees, shrubs, posts, buildings, grills, fill areas or any activities that disturb vegetation cover. Placement of rock stockpiles, fill material, fences or other activities that could induce turbulence, encourage flow concentrations, or increase the erosion potential of the spillway channel are prohibited.

- Spillway Exit - The area that would normally be designated as the exit for the Cherry Creek spillway is outside the project boundary. Whenever possible, the local zoning authority should be encouraged to implement flood plain management in this area to minimize the potential for damage if a spillway flow occurs.

Any proposed modifications or additions to the areas designated as the spillway entrance, spillway channel, or spillway exit are to be submitted for review and approval to the Omaha District Engineering Division.

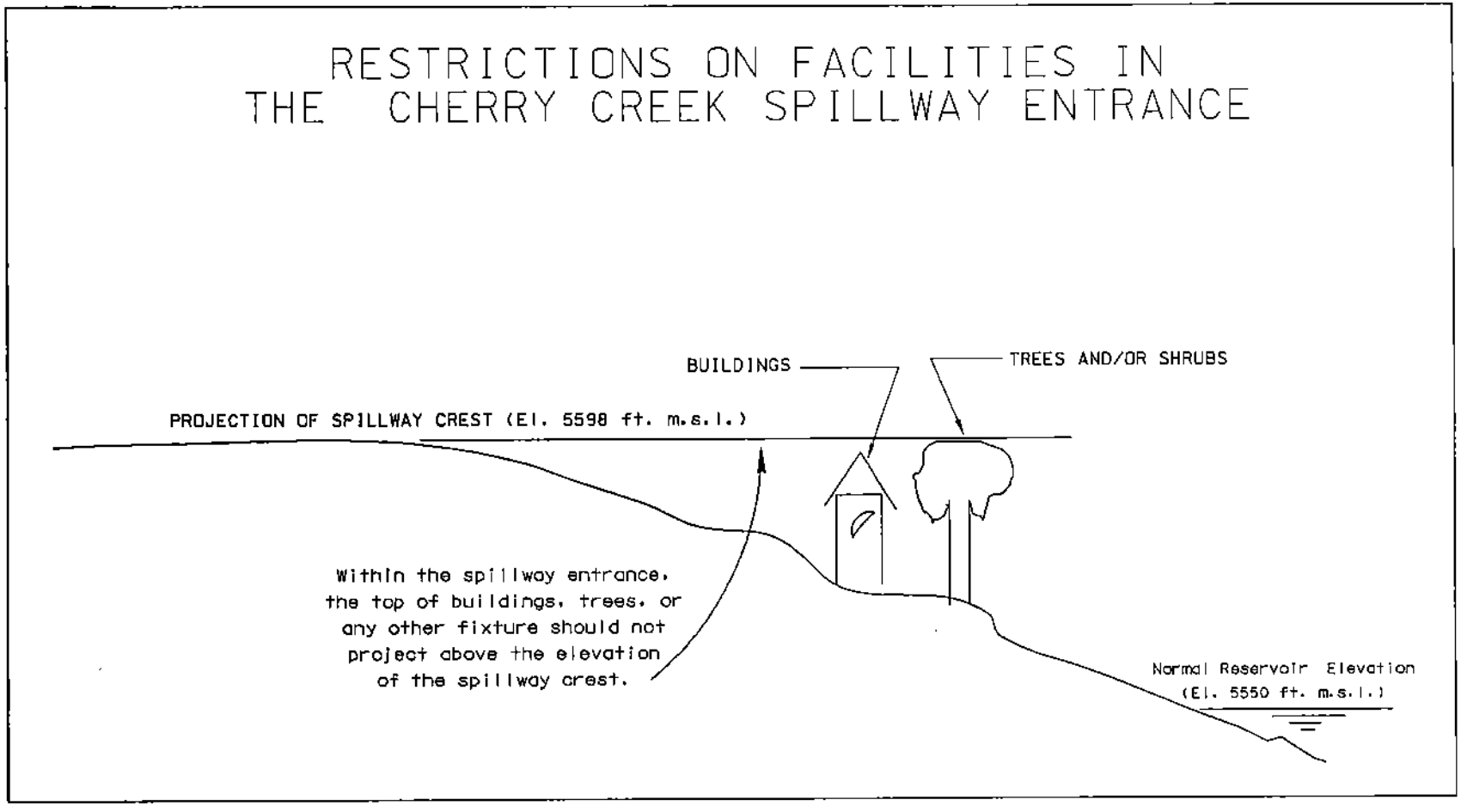

RESTRICTIONS ON FACILITIES IN
THE CHERRY CREEK SPILLWAY ENTRANCE
BUILDINGS
TREES AND/OR SHRUBS
PROJECTION OF SPILLWAY CREST (El. 5598 ft. m.s.l.)
Within the spillway entrance, the top of buildings, trees, or any other fixture should not project above the elevation of the spillway crest.
Normal Reservoir Elevation
(El. 5550 ft. m.s.l.)

FIGURE 2-5

SHORELINE EROSION

Most shoreline erosion results from reservoir wave action. Unprotected banks under attack by waves will cave into the reservoir. If the eroded material is not carried away by suspension or littoral transport, it will form a beach at the base of the cutbank. Given enough time and material, these natural beaches will develop so that incoming wave energy will be dissipated on them and shoreline erosion will be curtailed.

The increase in suspended material in the reservoir caused by shoreline erosion has increased turbidity and siltation in the lake. Shoreline erosion also adversely impacts esthetics, fish and wildlife habitat, and recreation.

ULTIMATE EROSION LIMITS

Shoreline erosion will continue along steep banks that are exposed to wave action unless special protection is provided. If no shoreline protection measures are implemented, it is projected that the banks of Cherry Creek Lake would recede to approximately the ultimate erosion limits shown on plates 6 and 7.

The ultimate erosion is the total cumulative bank recession expected during the life of the project (100 years in the case of Cherry Creek Lake). This erosion line was developed using the original (predevelopment) topographic map and a template approach in which the material eroded from the banks is balanced against the material added to the beach. It does not take beach areas or existing protected banklines into consideration. Predevelopment bank configurations would be expected to yield greater erosion estimates than existing conditions because most development would result in bank shaping and protection that would tend to reduce recession rates. Therefore, these ultimate erosion projections are believed to overestimate the erosion amounts.

Predevelopment conditions were used in the analysis because determinations of true existing bankline configurations would have been costly, timeconsuming, and beyond the scope of this study.

The ultimate erosion lines shown on plates 6 and 7 serve only as a general guide for planning purposes. Erosion concerns at specific sites along the lake must be analyzed individually because erosion rates can vary significantly depending on the location; bank material composition; bank configuration; and orientation, proximity of existing protection, and concentration of foot and boat traffic.

AREAS EXPERIENCING SHORELINE EROSION

A study conducted by Corps personnel in July 1988 determined that shoreline erosion is currently occurring at Cherry Creek Lake. The eroded reaches which were observed are discussed below. The reach lengths cited are approximate. Reaches in which the DPOR plans to install erosion control within 5 years are identified by an asterisk.

A 300-linear-foot earthen berm located on the upstream face of the dam was found to have moderate erosion. As part of the Omaha District's monitoring program, project structures are inspected annually. Although annual inspections have shown that erosion in this area has not worsened since 1988, this area is scheduled to be protected with riprap in the near future to prevent any further erosion from occurring.

Shoreline protection at the remaining locations is discussed below. The Omaha District received technical assistance and training from Waterways Experiment Station personnel regarding the use of aquatic plant species to provide shoreline protection.

A 400-linear-foot* reach near the marina was recently shaped to reduce erosion. Because of the potential for motorboat-generated waves and the heavy visitation in this area, installation of seeded matting was recommended.

A 200-linear-foot* reach located near the west boat ramp contains severely eroded steep banks with a beach at the base. Because of its proximity to the boat ramp, the beach is used as a boat beaching area. Because of the boat beaching use and the potential for motorboat-generated wave action, bank shaping and installation of Geoweb or a similar product were recommended.

Establishment of willow cuttings was recommended for two reaches, which were previously eroded but are currently inactive, to prevent active erosion during periods of high water. One reach, consisting of 100 linear feet*, is located north of the west side shade shelters; the other reach is located between the two east boat ramps.

The following reaches contained minor or moderate erosion and were recommended for the establishment of willow cuttings: 50 linear feet*, south of the west side shade shelters; 100 linear feet*, along the cove south of the west side shade shelters; 150 linear feet*, northwest of Lake Loop; 70 linear feet total consisting of two reaches, northwest of Prairie Loop; 50 linear feet, southeast of Prairie Loop; 100 linear feet, west of the waterskiing takeoff beach; and 70 linear feet, northeast of the swim beach.

Moderate erosion was observed on a 100-linear-foot reach of the sailboard beach. Because of the heavy foot traffic, it was recommended that Geoweb or a similar product interspersed with aquatic plants be installed.

A 400-linear-foot* reach near the east side shade shelters was moderately eroded. It was recommended that willow cuttings with spaced hard points be established to control erosion while facilitating the use of the shoreline by fishermen.

Moderate erosion, much of which may have resulted from heavy foot traffic, was observed on a 200-linear-foot* reach near the Dixon Grove jetty. Riprap and willow plantings were recommended.

Moderate erosion, much of which may have resulted from foot traffic, was observed on a 200-linear-foot* reach at Tower Loop. Willow plantings were recommended to protect the scarp from erosion, and riprap was recommended for the remainder of the area.

WATER QUALITY

DESIGNATION

Lake Water Classification. Cherry Creek Lake has a State of Colorado Class 1 designation for both recreation and warm-water aquatic life. The Class 1 recreational designation allows primary body contact (swimming). The Class 1 warm-water aquatic life designation defines Cherry Creek Lake as having acceptable water quality conditions, flow, and bed material for aquatic species which can withstand temperatures greater than 20 °C.

Water Quality Requirements. Section 10(c) of Public Law 89-234, the Water Quality Act of 1965, established the National Water Quality Standards Program. Executive Order 12088, dated 13 October 1978, requires that all necessary actions be taken for the prevention, control, and abatement of environmental pollution with respect to Federal facilities and that these actions comply with all pollution control standards. Applicable State water quality standards have been established and are amended every 3 years; the most recent amendment was effective in June 1988. A 0.035 milligrams per liter (mg/L) in-lake phosphorus limit has been placed on Cherry Creek Reservoir by the Colorado Water Quality Control Commission. This limit applies to both point and nonpoint sources. Efforts to achieve and maintain this in-lake limit are discussed in subsequent sections.

DATA COLLECTION

Three sampling stations have been established to monitor the water quality of the reservoir's tributary inflow, the reservoir water, and the water released from the dam. Samples are routinely collected six times annually from the inflow and reservoir stations. Releases are infrequent; however, when releases are occurring, samples are collected. It is the responsibility of the project sponsor to sample the swimming beach for fecal coliform bacteria to comply with Colorado State

standards and Corps Missouri River Division (MRD) Policy Number 28-5, dated 14 September 1987. These standards state that fecal coliform bacteria should not exceed a geometric mean of 200 organisms/100 milliliter (ml) of water for representative samples.

Inflows. Test results obtained during the last 2 years indicate that waters from Cherry Creek flowing into the reservoir have not met Colorado standards for the following parameters: aluminum, iron, manganese, suspended solids, lead, zinc, silver, selenium, sulfate, fecal coliform bacteria, and un-ionized ammonia. It is expected that future upstream urban development will continue to degrade the quality of the inflows. The development of detention structures upstream from the lake's off-project lands should be considered to reduce water quality problems, to improve fisheries, and to prolong the life of the lake. Wetlands established at on- or off-project lands may also improve water quality by acting as filters for sediment and some associated pollutants. Such actions should be coordinated with the Tri-County Health Department regarding mosquito concerns.

Releases. Release-water analyses are very infrequent. Few exceedences of State standards have been detected. Since 1979, only two parameters, copper and aluminum, have been detected as exceeding the Colorado water quality standards. There were no outflows in 11 of the 22 years in the period 1967 through 1988. This has resulted in the evaporative concentration of various pollutants and the degradation of water quality in the lake. When sufficient water is available, releases are made from this reservoir twice a year to flush sediments from the gate vicinity and to improve water quality. These releases may stop in the near future because downstream water rights have been adjudicated and sufficient water may not be available for flushing.

Reservoir. Reservoir waters have periodically exceeded Colorado State standards for aluminum, lead, iron, manganese, mercury, cadmium, copper, suspended solids, phenols, and fecal coliform bacteria.

Dissolved oxygen levels are generally sufficient throughout the water column; however, in summer, under very calm conditions, the reservoir may stratify. Dissolved oxygen levels at the lower depths have not met State standards during the periods of temporary stratification.

IMPACTS OF OFF-PROJECT DEVELOPMENT

Stormwater Runoff. Rapid urbanization in the Cherry Creek basin has had several adverse impacts on project resources. The surface cover of much of the area around the Cherry Creek Lake project has changed from fields to asphalt, concrete, and other impervious materials. As a result, absorption of precipitation by the soil has been dramatically reduced and stormwater runoff has increased. Many drainageways on the Cherry Creek Lake project receive stormwater runoff from residential and commercial development and discharge these stormwater flows into the lake. Urban runoff contains pesticides, herbicides, fertilizer, hydrocarbons, bacteria, sewage, and other pollutants. The effluent and urban runoff contain elevated amounts of nitrogen and phosphorus, which nourish algal growth and accelerate lake eutrophication. In the past, this lake has exhibited algal bloom problems. At the present time, the increasing turbidity results in light limitation which appears to be keeping the algal blooms in check.

The increase in impervious surfaces brought about by development increases the size of stormwater flows, and drainage conveyances such as storm sewers concentrate these increased flows. Under the provisions of Colorado Revised Statute 30-28-133(4)(b), the State of Colorado requires each board of county commissioners to include in its subdivision regulations the standards and technical procedures which ensure, by detention or other means, that discharges of stormwater originating from a subdivision during a precipitation event less than or equal to the 100-year event do not exceed the 100-year historic flows under undeveloped conditions. Adherence to these standards ensures that development will not cause a change in the boundaries of the 100-year flood plain. Because the Corps is the only landowner downstream from

subdivisions which are adjacent to the Cherry Creek Lake project, developers or jurisdictions have often assumed that the 100-year historic flow standard need not apply. Fortunately, developers and jurisictions no longer make this assumption. To ensure consistency in its dealings with developers in the Denver area, the Omaha District will not support waivers to local ordinances and/or State standards for stormwater flows entering the Cherry Creek Lake project from adjacent development.

Soil Erosion. The sandy soils predominant in the Cherry Creek Lake project are very susceptible to erosion. Urban stormwater flows have been funneled into drainageways flowing toward the project by storm sewer systems of adjacent developments, often without proper erosion protection measures. Soil erosion and formation of deep gullies have been accelerated by the increasing size, velocity, and frequency of these stormwater flows. In addition, urban development which lays the land bare during construction results in greatly increased sediment input to the lake. Every effort will be made to keep sediments resulting from erosion at areas under construction from adversely impacting project resources.

The most extensive soil erosion has occurred along Shop Creek and Quincy Drainage, which discharge runoff from numerous subdivisions in Aurora into Cherry Creek Lake. Shop Creek began experiencing major erosion problems in the 1970's. Erosion proceeded even more rapidly along Quincy Drainage, which escalated from a 2-foot-deep swale parallelling Quincy Avenue in 1980 to a 20-foot-deep gully by 1983. The Corps negotiated with the City of Aurora to construct retention ponds and/or wetlands to better manage stormwater flows in Shop Creek and Quincy Drainage. Under the terms of a Memorandum of Understanding (MOU) between the City of Aurora and the DPOR, drainageway improvements to rectify erosion problems associated with stormwater flows in Shop Creek and Quincy Drainage were constructed on project lands in 1988 and 1989 by the City of Aurora and will be maintained by the DPOR. The Shop

Creek improvements, consisting of soil-cement gravity structures and wetlands, have been completed. The wetlands and the covered and uncovered drainage channels of the Quincy Drainage improvements have been constructed on Corps lands, but a water quality control pond still needs to be developed on the City of Aurora's property within the Quincy Drainage area. Erosion in these two drainageways has been costly to solve and has added to the sediment deposits and delta buildup in the lake.

Many other stormwater drainages or storm sewer exits are located on the Cherry Creek Lake project. Erosion is currently occurring on project lands near Belleview Avenue and the Cherry Creek Vista subdivision. Although the erosion is minor at the present time, these eroded areas should be repaired and/or seeded to prevent the problem from becoming more severe.

The Shop Creek and Quincy Drainage cases demonstrate the Corps' commitment as a landowner to protect its resources against damages resulting from violations of State and local regulations. Even when no violations of regulations have occurred, the Corps intends to work with development interests on a case-by-case basis to prevent damage to project lands and waters. An example of this type of cooperation could involve the construction of detention ponds or swales on the developer's property and wetlands on Corps property.

The preferred method for controlling urban runoff is to curtail it at its source. To prevent erosion problems or to rectify them at an early stage, when they are easier and less costly to correct, cooperative planning and monitoring efforts by the Corps, project lessees, and local jurisdictions are necessary. To prevent damage to project resources from future development, a procedure for review of development proposals has been established. Proposals for development located adjacent to the Cherry Creek Lake project or expected to adversely impact project resources are provided to the DPOR through the

SRA office by the developer and/or the local governmental jurisiction. If the DPOR is amenable to the development proposal, it forwards the proposal to the Tri-Lakes Project Office for Corps review. The Corps provides review comments to the developer and coordinates closely with the DPOR staff. The outcome of this review should be the continued integrity of the project and its uses, advice to the developer or other authority on how to minimize impacts, and a plan of action agreed to by all parties. The review process should include consideration of off-project detention to minimize erosion and water quality degradation and the development of wetlands on-project or off-project to slow the flow of water and provide the potential for water quality improvement.

PROBLEMS AND CONCERNS

Cherry Creek Lake is a terminal storage reservoir with little or no significant discharge. Because releases have been negligible, the primary loss of water is due to evaporation. The inflowing waters originate in or pass through rapidly urbanizing areas. These inflows carry sediment, nutrients, and metals which accumulate in the reservoir and are concentrated as a result of evaporation. Cherry Creek Lake presently exhibits occasional water quality exceedences of heavy metals and other substances. Ongoing sampling indicates that concentrations of many of these substances are increasing. It is anticipated that the water quality will worsen in terms of exceedences of State standards. Reservoir flushing or hypolimnetic discharge is effective in improving the reservoir water quality but requires thousands of acre-feet of water which are not ordinarily available. Downstream water rights are currently being administered, and releases from the reservoir to accommodate the water rights may result in an increasingly shallower reservoir. As depths become shallower, the reservoir will also become more turbid and less esthetically appealing. Some measures to improve or prevent further degradation of the lake's water quality and recreation potential are completed or ongoing, and additional measures need to be implemented. Otherwise, extremely costly measures may be

necessary to preserve the viability of the lake and the level of water-based recreation opportunities it offers.

POTENTIAL SOLUTIONS

Past and Ongoing Efforts. Past and ongoing Federal water quality management efforts have been minimal. Omaha District and project personnel have worked with the DPOR and the City of Aurora to resolve water quality and erosion issues at Shop Creek and Quincy Avenue. In addition, the DPOR has constructed a perimeter road which traps some Cherry Creek sediments, thus providing limited water quality improvements.

Degradation of Cherry Creek Lake water quality is of major concern to the Denver metropolitan area because of the lake's recreational importance to the region. The "Cherry Creek Reservoir Clean Lakes Study" (Clean Lakes Study), completed by DRCOG in 1984, identified phosphorus as the primary nutrient promoting the accelerated eutrophication of the reservoir. The Clean Lakes Study recommended the establishment of an in-lake phosphorus standard of 0.035 mg/L. This standard was subsequently adopted by the Colorado Water Quality Control Commission. Local jurisdictions within the Cherry Creek basin, in cooperation with DRCOG, developed the "Cherry Creek Basin Water Quality Management Master Plan" in 1985. This management plan identified the most effective methods for protecting water quality in the basin and for complying with the 0.035 mg/L total in-lake phosphorus standard. The CCBWQA, which consists of members of local governments, was created to manage the basin for the purpose of maintaining the water quality in Cherry Creek Lake and its tributary streams and drainageways. In 1988, the CCBWQA was granted recognition and taxing authority by the State legislature to manage the basin for the prevention of water quality degradation. Funds for investigation of the water quality problems and implementation of solutions are obtained from user fees, a tax on real property, a fee for grading areas larger than 1 acre, and a surcharge on wastewater treatment plant flows. In 1988 and 1989, the CCBWQA

investigated in-basin and in-lake treatment methods to control both point and nonpoint pollution sources. The draft final report of these investigations, "Evaluation of In-Reservoir Control Options", was prepared by Camp Dresser & McKee, Inc. in association with Riverside Technology, Inc., for the CCBWQA in November 1988. The "Cherry Creek Basin Water Quality Management Master Plan", revised in 1989 by the CCBWQA, discussed these options; each option was either eliminated or considered deserving of continued study.

Study Results. Based on the results of its investigations in 1988 and 1989, the CCBWQA concluded that any strategy for achieving water quality goals must include both in-basin control measures (such as sewage effluent phosphorus limitation, construction of wetlands for sediment trapping, and phosphorus removal) and in-reservoir measures (such as dredging or nutrient inactivation of the sediments). A monitoring program designed for reservoir management was also suggested. There is concern that any action which decreases turbidity could increase undesirable algal bloom severity because light appears to be a limiting factor.

These reservoir improvement efforts are currently ongoing, and no final decisions have been made at this time. In April 1989, the CCBWQA met with jurisdictions within the basin to determine whether any potential remedial actions identified in the draft study were unacceptable. Actions considered potentially unacceptable included draining the lake to remove sediments (because downstream water rights are being administered, water may not be available to refill the lake), algal harvesting, introduction of grass carp, artificial destratification, physical/chemical treatment, and reservoir flushing/hypolimnetic discharge.

Based on a 1988 study by Corps personnel, it is recommended that the use of aquatic plants and/or matting to halt shoreline erosion should be

seriously considered. This action would decrease sediment input to the reservoir, protect the existing shoreline, and improve fisheries.

Potential Actions. Restoration of the water quality and viability of Cherry Creek Lake are major components of the comprehensive task of stewardship of project land and water resources. To achieve these goals, coordination and cooperation between Federal and State agencies and local jurisdictions is essential. Potential actions by the Corps, in conjunction with State and local efforts, to address the water quality needs of Cherry Creek Lake are itemized in table 2-3.

Table 2-3
Potential Actions by the Corps of Engineers and/or Others
To Aid Water Quality Restoration at Cherry Creek Lake

Objectives	Actions
Minimize erosion	Coordination between the sponsor, local jurisdictions, SCS, developers, and so forth
Manipulate water levels	Operate gates accordingly
Stabilize shoreline	Install aquatic plants along shore, riprap, and so forth
Minimize sediment problems	Dredge, stabilize the delta, construct sediment retention structures
Stabilize delta	Establish aquatic plants, create wetlands/islands
Improve stormwater inflow quality	Construct detention ponds or wetlands; request to EPA [1] or State agency for NPDES [2] permits for storm sewers
Educate the public and appropriate agencies on impacts of off-project actions on project resources	Establish appropriate programs

[1] Environmental Protection Agency
[2] National Pollution Discharge Elimination System

BIOLOGICAL RESOURCES

A number of factors have affected Cherry Creek Lake project's natural resources and may continue to limit the potential for diversity and productivity. Tree growth is limited except along drainageways because of the dry climate and shallow soils. Historically, project lands were developed for agriculture, displacing much of the native vegetation. Project construction further disturbed the area.

Today, the Cherry Creek Lake project is located in a highly urbanized environment. This is shown by the Development Plan (plates 5 through 9) and by an aerial photograph (plate 10). Nearby residential developments contribute to erosion and water quality problems on the project. Overgrazing by prairie dogs is a problem. The site is a very popular recreation area for the surrounding urban residents, and the intensive recreation use limits use of the project by wildlife. Development of major roads adjacent to and through the project has also caused a reduction in wildlife habitat. Two potential future road projects--expansion of Parker Road and construction of a Cherry Creek crossing road--could also adversely affect wildlife use of the project.

In spite of these limitations, a variety of habitats--upland grasslands, riparian woodlands, wetlands, bottomlands, and aquatic areas--serve to attract and support wildlife at Cherry Creek Lake. The project provides the largest usable area of wildlife cover in the expanding southeastern part of the Denver metropolitan area. Lands and waters at the project are managed for wildlife habitat as well as for project operation and recreation. Visitors value the natural resources of the project. The opportunity for recreationists to participate in and receive maximum enjoyment from bird watching, wildlife observation, nature study, photography, sightseeing, and fishing depends on continued good stewardship of the biological resources at the project.

HABITAT TYPES

Upland Habitat. Vegetation in the upland areas of the Cherry Creek Lake project consists mainly of grasses. Prior to the construction of the Cherry Creek Lake project, a large portion of project lands were developed for agricultural uses. This altered the composition of the native shortgrass prairie vegetation. After project construction, native grasses were reintroduced in the upland areas, which had previously been cultivated, to enhance wildlife habitat. The re-established shortgrass prairie ecosystem at the project is still relatively fragile. Erosion, which has been accelerated by stormwater runoff from nearby urban development, and overgrazing by prairie dogs continue to alter the vegetative composition, thereby reducing the capability of the grasslands to support wildlife.

Upland vegetative cover on the western side of the project consists primarily of grasses. Dominant grasses include western wheatgrass, blue grama, buffalograss, and needlegrass species. However, the native grass species are being engulfed by increasing thistle populations. Trees are sparse on the uplands because of the dry climate and because of the shallow soils found on the west side of the lake. Cottonwood, willow, and hackberry trees and cattails are found in creeks and stormwater drainageways, where soil moisture is adequate. Beginning in 1988, the DPOR in cooperation with the Colorado State Forest Service planted cottonwood, Russian olive, and American plum trees along several drainageways in the western portion of the SRA. The plantings will provide food and cover for wildlife.

Upland vegetation on the east side of the project also consists primarily of grasses and forbs. Cottonwood, elm, and willow are the predominant tree species; however, tree growth is mainly limited to the sides of the spillway structure, shelterbelt plantings in buffer zones and campground areas, and areas near stormwater drainageways. On the sides of the spillway, cottonwood; elm; willow; and understory species, such as plum, provide excellent cover for wildlife. Cottonwood and

juniper have done well in the camping areas, providing shade for recreationists as well as habitat for some wildlife species. Cottonwood and willow are frequently found adjacent to stormwater drainageways. Tree growth along the bottom of the spillway structure is inhibited by saturated soil conditions and open water.

Upland forbs commonly found throughout the project area include yucca, rabbitbrush, sunflower, cactus, and thistle. Western sagebrush, which provides cover for jackrabbits, and prickly pear cactus are found on and near the spoil piles located just outside the hydrologic spillway. These two plant species are indicators of the dry conditions and low human disturbance. The presence of bush morning glory between the spoil piles and the spillway embankment indicates that this area may be returning to native prairie conditions.

Bottomland-Wetlands. Approximately one-third of Cherry Creek project lands lying above the multipurpose pool elevation can be classified as wetlands or wet bottomlands. Typical wet bottomland vegetation consists of trees such as cottonwoods and willows; wet meadow grasses such as switchgrass, prairie cordgrass, and Canada wild rye; and rooted aquatics such as cattails, bulrushes, and arrowhead.

Wetlands or wet bottomlands typically show various stages of plant succession, and Cherry Creek bottomlands are no exception. Portions of the riverine bottomlands were historically farmed and are in various stages of recovery. Sedimentation, erosion, and hydraulic changes are also changing the conditions for vegetation growth. Areas of bed cutting will become drier, and areas of accretion may become moister. Areas now in herbaceous growth may support woody plants in the future.

The riparian vegetation along Cherry Creek contains a mosaic of vegetative types. Many grassland areas of the bottomlands include common milkweed or Canada milk vetch as the predominant forbs, with Woods rose often being a forb of secondary importance. Leafy spurge is

also found here. Leafy spurge is a noxious weed and is not particularly valuable to wildlife; measures for its control are being implemented by the Corps and the DPOR.

Cottonwood Creek has become incised because of the increased stormwater flows caused by urbanization in the basin. Because of the degradation of the streambed, most banks of Cottonwood Creek no longer contain riparian habitat. The DPOR is coordinating with the Colorado Division of Wildlife (DOW) and the CCBWQA regarding the potential creation of ponds to raise the water table and restore riparian habitat. A series of drop structures installed in Cottonwood Creek and excavation in alluvium to a level below the water table are the methods being discussed.

There are extensive stands of cattails and rushes where Cherry Creek and Cottonwood Creek flow into the lake. Sediment deposited by these streams has resulted in delta formation in the upstream end of the lake and elevation of the water table. Even areas which lie on the side of the perimeter road away from the lake show evidence of increasingly saturated soils. The water table will rise still more in conjunction with the proposed raise in the multipurpose pool elevation. This will increase the amount of wet meadow and other wetlands vegetation at the project.

An increase in pollutants in stormwater drainage from urban development in the Cherry Creek basin has increased salinity in soils near the delta which are saturated for at least part of the year. Large stands of foxtail barley, which has a mild tolerance for saline conditions, extend beyond the perimeter road for distances of up to 25 meters. Saline conditions are expected to increase as additional land in the Cherry Creek basin becomes urbanized and as evaporation continues to concentrate nutrients and metals. It can be assumed that species of increasing salt tolerance will become established as salinity increases.

Urban stormwater drainages support emergent aquatics such as watercress and smartweed. Wetlands are a major feature of the Shop Creek and Quincy Drainage improvements; to expedite wetlands establishment, wetlands "pads" were transplanted from the delta area to these two drainageways.

The spillway area is one of the most beneficial parts of the project for wildlife in terms of food, water, cover, and variety of habitat. The dense vegetation adjacent to the spillway channel and the steep banks and wet areas in the spillway channel discourage all but the most dedicated naturelovers from visiting the spillway area. Low visitation results in low disturbance levels, which is conducive to wildlife use. The depth of the water at the bottom of the spillway varies--cattails grow around the edges of wetlands but open-water areas are also common. This habitat, with both open water and cover, attracts both resident and migrant wildlife including aquatic birds. The proposed spillway restoration and maintenance program, discussed in chapter III, would substantially reduce existing wildlife habitat values. Appropriate mitigation would be included in the implementation of any spillway restoration program.

Aquatic Habitat. Cherry Creek Lake is eutrophic, and algal concentrations reach a high point during the summer. The primary factor limiting algal growth in Cherry Creek Lake appears to be high turbidity, which limits the availability of sunlight to algae. Pondweed and duckweed, the primary aquatic plants, grow throughout the lake and provide food and habitat for aquatic birds. Submerged trees in the delta area at the upper end of the lake provide shelter for young fish.

WILDLIFE

Mammals. The majority of the wildlife at the Cherry Creek Lake project consists of nongame species. Small furbearers which are year-round residents at the Cherry Creek project include red fox, gray fox, racoon, long-tailed weasel, mink, badger, fox squirrel, thirteenlined

ground squirrel, beaver, and muskrat. They often use the riverine bottomlands and the spillway area for cover and forage. Coyotes have occasionally been sighted at the extreme southern edge of the project, close to the still-undeveloped portion of the Cherry Creek basin. Coyotes and foxes have been sighted on the downstream side of the dam near I-225.

The prairie dog is the species of primary importance at the Cherry Creek project because this species has the highest potential for impacts to the upland vegetation and to other wildlife. The shortgrass prairie supports two separate black-tailed prairie dog populations at the project. A large number of prairie dogs inhabit the southwestern portion of the Cherry Creek project. A smaller colony inhabits the open grasslands of the spillway area.

The prairie dog population may present a hazard in terms of dam safety and project operations because of its capacity to damage major earth-filled structures by burrowing activity. Prairie dogs have also contributed to the invasion of large grassland areas of the project by Russian thistle, Canadian thistle, and bull thistle. Overgrazing of the native grasses by prairie dogs has resulted in diminished ability of the grasses to compete, rendering the prairie vulnerable to thistle invasion. A dwindling grass supply has led prairie dogs to abandon many of their burrows in thistle-infested areas. The prairie dogs have literally eaten themselves out of house and home.

Upland game species in the project area are limited to a small number of antelope, white-tailed deer, and mule deer. Approximately 30 mule deer inhabit the creek bottom, wet meadow, and spillway areas. The wooded bottomlands provide shelter, and the adjacent grasslands provide forage. Deer crushes are commonly observed in the switchgrass near the wooded riparian vegetation along Cherry Creek. Because hunting on the

project is prohibited, the only threats to the continued presence of these upland game species are human disturbance, a reduction in habitat, or disease.

Birds. Prairie birds that may occur in the area include meadowlarks, bobolinks, Lincoln sparrows, and dickcissels. Upland game bird species include the ring-necked pheasant, mourning dove, and bobwhite. However, populations of these game bird species are generally quite low. Raptors, songbirds, and waterfowl are commonly found in the spillway and delta/flood plain areas.

Canada geese, mallards, and pintail ducks are common year-round residents at Cherry Creek Lake. Green-winged teal, blue-winged teal, shovelers, and common mergansers migrate semiannually through the project area. Low disturbance levels, resulting from low use by people, encourage waterfowl species to use the spillway channel, the upper end of the lake, and the marshy areas of the delta for roosting and/or breeding. However, many marshy areas of the delta lack good breeding/nesting habitat because the growth of cattails, bulrushes, and other rooted aquatic plants is too dense. Selective dredging to provide deeper open water within the marshy areas of the delta would enhance wildlife production potential. Any such dredging would need to provide sufficiently steep slopes and deep water to avoid aggravating mosquito breeding unless prior support for the project is obtained from the Tri-County Health Department.

Fish. The eutrophic nature of the lake can result in low dissolved oxygen content. Sediment deposits on the lake bottom provide poor spawning habitat for fish. Gizzard shad, carp, catfish, bullhead, suckers, bluegill, and sunfish are among the primary self-sustaining fishery populations. Stocking of trout, walleye, wiper, and other game fish species is necessary to attain a balance between forage and predator species. Sport fishing for walleye and for panfish is a high-quality recreation experience at Cherry Creek Lake.

The Tri-County Health Department stocks *Gambusia* fish in the spillway wetlands. These fish keep down mosquito populations in the spillway. While mosquitoes are not a serious problem at the project, the spillway area is the part of the project with most potential for mosquito problems. This is partly because of the proximity of the housing areas. The *Gambusia* also serve as a supply source when the Health Department needs to stock other waters. The *Gambusia* have caused concern as a competitor with native species in the Platte River. *Gambusia* should not be stocked in Cherry Creek reservoir before coordinating closely with the DOW.

Threatened or Endangered Species. A biological assessment has been conducted for actions proposed in this Master Plan, and no effect on threatened or endangered species has been found. At this time, no federally listed threatened or endangered species are year-round residents of the Cherry Creek Lake project area. Seasonal use of the delta area by migrating bald eagles does occur. Cottonwoods are the most common trees to be used for perching, roosting, or loafing. Winter use of Cherry Creek Lake by bald eagles is uncommon, however, because of the lack of open-water habitat.

At one time, the black-footed ferret may have been a predator in the prairie dog community. Use of the project area by the black-footed ferret would have been eliminated through early agricultural practices--primarily, poisoning of the prairie dog community. Natural controls, barriers, and poisoning are methods used to control the prairie dog population. Because the black-footed ferret avoids urban areas and because no naturally occurring black-footed ferret populations are found in the Denver vicinity, migration of the black-footed ferret to the Cherry Creek Lake project would be unlikely.

Peregrine falcons migrate through the area and may find prey along the project, but they do not nest in the area. Whooping cranes may migrate through this area if uncommonly bad weather conditions force them to, but they are not likely to land at the project.

MANAGEMENT CONCERNS

The existing fish and wildlife populations, and their habitat, are under steady and growing pressure from the surrounding urban development. Water quality concerns and delta formation were described in earlier sections, and the spillway maintenance issue is discussed in chapter III. Aside from these difficulties facing fish and wildlife, project managers must also deal with problems caused by fish and wildlife. These include prairie dog control, snakes, and weed control.

Prairie Dog Control. Recent construction of the City of Aurora's ballfield complex at the northeast end of the spillway has increased burrowing activity in the disturbed areas. Also, burrowing on the dam embankment needs to be controlled for dam integrity. There is a lack of predators for prairie dogs at the project. Methods of natural population control should be explored. One method of pursuing natural control could be the construction of raptor perches. A test of the effectiveness of raptor perches would be possible in the spillway area. Artificial methods of control include "gassing" of tunnels with vehicle exhaust fumes, although this would kill any animal in the tunnels. Rodenticides are effective, but if rodenticide applications are to be used, some restrictions on their use need to be incorporated into the OMP and annual management program. For example, carcasses of dead prairie dogs outside burrows need to be removed as quickly as possible from a treated area and the burrows need to be covered. If this is not done, a further loss of predators would be expected from progression of the poison up the food chain. A fourth method of control is the use of aluminum phosphide tablets. Although these reportedly suffocate the prairie dogs without bioaccumulation, the effect of these tablets on other rodents, snakes, burrowing owls, or other species should be

considered. The Tri-County Health Department recommends insecticide dusting of prairie dogs prior to significant prairie dog control efforts to prevent the dissemination of plague-transmitting fleas.

Snakes. In past years, removal of dirt from the spoil piles near the spillway caused a migration of prairie dogs from the spillway area to nearby residential areas. The City of Aurora felt that prairie rattlesnakes migrated to nearby homes along with prairie dogs. While there may have been a few prairie rattlers, it is highly likely that most of the snakes were bullsnakes. At this time, rattlesnakes do not present a threat to the health and safety of nearby residents.

Weed Control. The increasing population of invading weeds will continue to need control efforts. Bull, Russian, Canadian, and musk thistles grow on project lands. Thistles are noxious weeds. Colorado does not yet have a law regulating noxious weeds. Should such a law be passed, the Corps will determine its responsibilities as a landowner.

Currently, the DPOR conducts a thistle control program with limited funds. Burning and chemicals are both used. Each of these methods could come under closer restrictions in the future from increasing environmental regulation. Biological controls may be more available in the future and need to be investigated and used to the extent practical.

Leafy spurge is also becoming more of a problem. This plant needs to be controlled using whatever combination of methods that proves to be effective.

ESTHETIC RESOURCES

The esthetic resources at the Cherry Creek Lake project are many and varied. The most distinctive esthetic aspect is the view of the Front Range to the west. The surrounding plains topography makes it possible for a viewer to see for miles in every direction from the top of the dam. Pull-off areas have been constructed with access from the dam crest road to facilitate visitors seeking vistas of the Front Range, Cherry Creek Lake, and/or metropolitan Denver. Views of the sunset and sunrise are especially scenic when viewed from near or on the lake because of the minimal intrusion of urban structures.

Several wooded areas provide green respite for the eyes as well as shade in this tree-sparse area. Sprinkler systems are proposed by the DPOR to increase the greenery and permit increased visitation in several picnic areas. Shoreline vegetation plantings, which are recommended for erosion control, may also enhance esthetics.

Gently rolling grasslands dissected by intermittent stream drainageways surround the lake. The undulating topography ordinarily provides a pleasant view. However, some drainageways have been turned into eyesores by gully erosion which has been caused or exacerbated by increased flows and frequency of storm drainage from urban development in the Cherry Creek basin. As previously discussed in chapter II, the City of Aurora and the CCBWQA are financing improvements to the eroded drainageways of Shop Creek and Quincy Drainage on and off Cherry Creek Lake project lands to ameliorate this situation.

Wind-generated waves lapping against the shoreline are restful to the ears as well as tantalizing to the eyes. As previously discussed in chapter II, the administration of inflows to Cherry Creek Lake to satisfy downstream water-rights holders could result in a progressive lowering of the lake level. Such a lowering would have adverse esthetic

impacts. A 2-foot drop in the multipurpose pool level (to 5548.0 feet m.s.l.) would expose 60 acres of lakebed as mudflats; additional lakebed would be exposed if the lake level should drop even lower. The existing shoreline would also be exposed as unsightly unvegetated scarps. The DPOR is investigating potential ways of compensating for the evaporation losses so that these adverse esthetic impacts at Cherry Creek Lake will not materialize.

HISTORIC PROPERTIES

PREHISTORIC OCCUPATION

The earliest occupation in this western extension of the Great Plains, which includes the project area, is labeled the Paleo-Indian period. Occupation associated with this period dates from approximately 10,000 B.C. to 6000 B.C. and is characterized by big game hunting, the use of large projectile points, and a nomadic lifestyle. No sites that date to this period have been reported in the project area. It is possible, however, that cultural material associated with this period may be unearthed in the vicinity of Cherry Creek Lake because other sites from this period have been found in the Denver area, including the Lamb Springs site, which is located near Chatfield Lake.

The Archaic period dates from 6000 B.C. to approximately 500 B.C. It was followed by the Post-Archaic period, the last period of prehistoric occupation. The people who lived in this area during the Archaic are known to have exploited a wide variety of vegetal foodstuffs and smaller game animals. Bison became more abundant throughout the Post-Archaic period. Some of the sites reported in the project area are characteristic of both these periods.

HISTORIC OCCUPATION

Substantive occupation of the area by Euro-Americans, which marks the Historic period, began in the early to the middle part of the 19th century. Early movement of freight and people through the area was by a system of trails, several of which passed through the project area. These trails included the Cherokee Trail, which was a branch of the Santa Fe Trail; the Goodnight-Loving Trail; and the Smoky Hill Trail. The Twelve-Mile House, which was located in the project area, was an important outfitting station, stagecoach stop, and post office on the Smoky Hill Trail. The structure has been moved to off-project land, and the original site of the house was excavated to recover data on the

early occupation of the area. The only other site that dates to this period is a historic farmstead that has been abandoned; all the buildings have been removed.

HISTORIC PROPERTIES MANAGEMENT

Historic properties management procedures comply with ER 1130-2-438 and other Federal laws and regulations. The following paragraphs detail how the three basic steps of the compliance procedure have been applied at the Cherry Creek Lake project.

Step 1 - Identification and Inventory. The area was originally studied by employees of the Smithsonian Institution in 1946. They reported a set of sites, and some of these were archeologically tested to determine their relative importance. Some of the staff members of the University of Denver performed some additional testing in 1948. Following the testing, some additional small-scale archeological surveys were done on areas that might be impacted by construction associated with recreation development. In 1982, a reconnaissance study of the Cherry Creek Lake project area was completed by a staff archeologist from the Omaha District.

Step 2 - Evaluation. Three of the 10 sites reported in the Cherry Creek project area in 1946 have been destroyed. None of the remaining seven sites are considered to be eligible for nomination to the National Register of Historic Places (NRHP).

Step 3 - Protection. All earthmoving activities must be coordinated with the Omaha District cultural resource staff prior to implementation. It is possible that land-altering activities near reported sites will unearth important new information.

Existing historic properties at the Cherry Creek Lake project do not appear to be adversely impacted by erosion, vandalism, or any other destructive agents at the present time. Interpretation at the site of the Twelve-Mile House on the subject of pioneer transportation will be considered for inclusion in any future development plans.

SOCIOECONOMIC CHARACTERISTICS

AREA OF INFLUENCE

During the summer of 1984 and the winter of 1985, a survey of visitors in vehicles was conducted by the Corps at the east and west entrances to Cherry Creek Lake, as well as at Chatfield Lake and Bear Creek Lake. The survey indicated that approximately 93 percent of the Cherry Creek Lake visitors resided in the Denver PMSA, which consists of Adams, Arapahoe, Denver, Douglas, and Jefferson Counties. These five counties are considered the area of influence (market area) for Cherry Creek Lake and are shown in figure 2-6. The primary area of influence consists of the Denver and Arapahoe Counties, which are adjacent to the Cherry Creek Lake project and which accounted for 84 percent of the visitation surveyed in 1984 and 1985.

POPULATION

Population data and projections for the Denver PMSA are presented as table 2-4. The Denver PMSA has constituted approximately 49 percent of the population of the entire State of Colorado since 1960. The population of the Denver PMSA nearly tripled between 1950 (when Cherry Creek Dam was constructed) and 1990 and nearly doubled between 1960 (when the lake was first used for recreation) and 1990.

Table 2-4
Population of the Denver PMSA
1950 - 1995

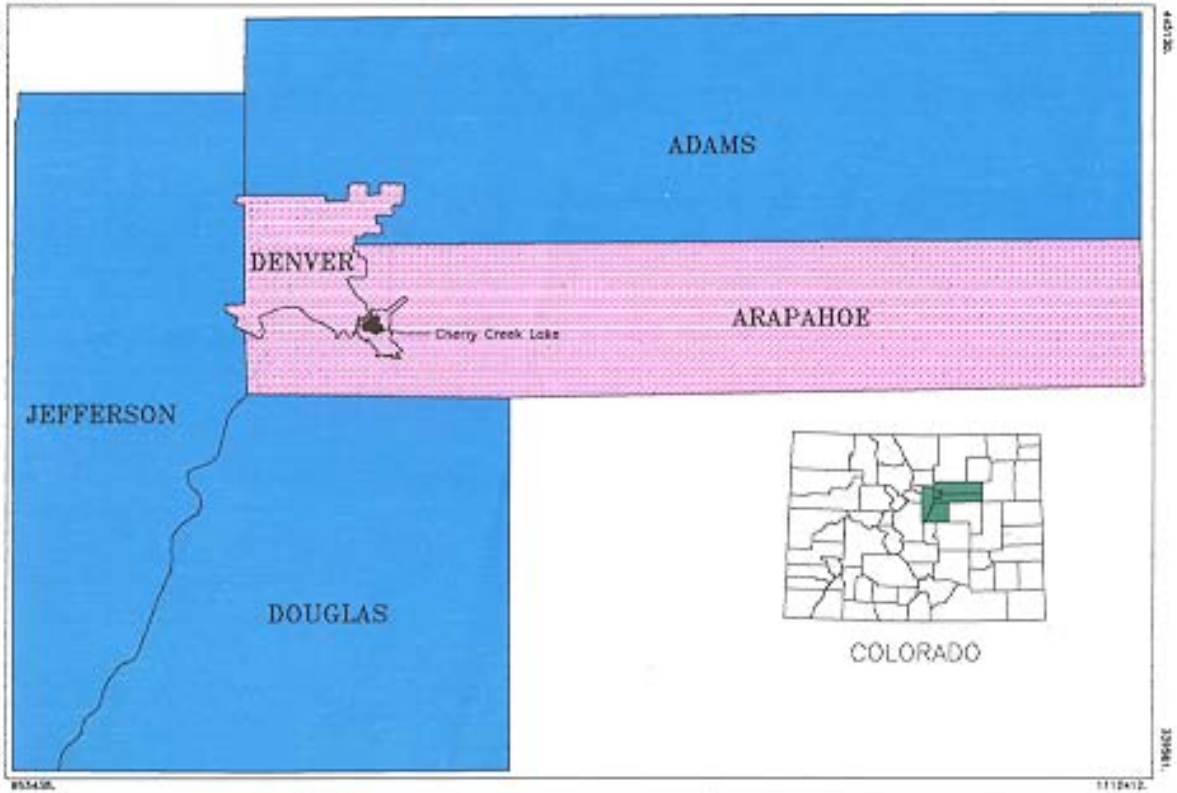
Geographic Area	1950	1960	1970	1980	1990	Percent Change 1980-90	Projected 1995
Adams County	40,234	120,296	185,789	245,944	265,038	7.8	278,900
Arapahoe County	52,125	113,426	162,142	293,621	391,511	33.3	441,100
Denver County	415,786	493,887	514,678	490,014	467,610	-4.6	470,700
Douglas County	3,507	4,816	8,407	25,153	60,391	140.1	74,700
Jefferson County	55,687	127,520	235,368	374,107	438,430	17.2	468,600
Denver PMSA	567,339	859,945	1,106,384	1,428,839	1,622,980	13.6	1,734,000
Colorado	1,325,089	1,753,947	2,209,596	2,889,964	3,294,394	14.0	3,497,300

Source: U.S. Department of Commerce, Bureau of the Census, and Donnelley Demographics (September 1990), Dun and Bradstreet.

MAP LEGEND

PRIMARY AREA OF INFLUENCE

SECONDARY AREA OF INFLUENCE



COLORADO

U.S.ARMY CORPS OF ENGINEERS

$$— THINK VALUE ENGINEERING —$$

CHERRY CREEK LAKE
MASTER PLAN
AREA OF INFLUENCE

FIGURE 2-6

EDUCATION

The population of Colorado, and the Denver PMSA in particular, is highly educated compared to that of the United States as a whole. Since 1960, the percentage of persons aged 25 years or older who had completed 4 or more years of college has been higher in Colorado than any other State. In 1980, 23 percent of Coloradans were in this category, and the State of Colorado Office of Economic Development indicated that the 23-percent figure was still true in 1990. Educational attainment in the Denver PMSA in 1990 was even higher, with 24.3 percent of persons at least 25 years old having completed 4 or more years of college.

EMPLOYMENT

Industries. Colorado's principal industries are manufacturing, government, tourism, agriculture, and aerospace. The principal manufactured goods are computer equipment, processed foods, machinery, aerospace products, and rubber. Tourism is a major industry, with an income of $4.5 billion in 1986. More than 7 million out-of-State people visit Colorado annually, and a majority of these visitors pass through the Denver PMSA.

Labor Force. Labor force distribution in the Denver PMSA is very similar to that of Colorado as a whole, as shown in table 2-5.

Table 2-5
Labor Force Distribution By Percent, 1986

Employment Category	Colorado [1]	Denver PMSA [2]
Wholesale and Retail Trade	25	24
Services	24	23
Government	19	17
Manufacturing	13	12
Finance, Insurance, and Real Estate	7	8
Transportation and Related Utilities	6	8
Contract Construction	4	5
Mining	1	2
Agricultural Services, Forestry, Fishing, and Other	1	1
TOTAL	100	100

[1] State of Colorado Office of Economic Development, "Colorado: the New Frontier," 1988.

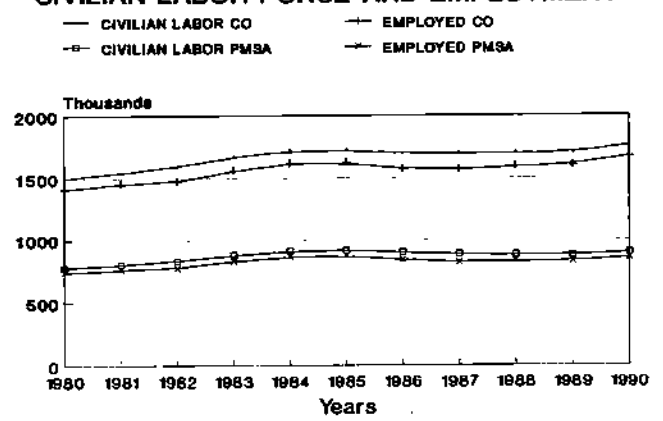
[2] Bureau of Labor Statistics, 1989.

ECONOMY

During the 1980's, economic trends in the Denver PMSA were similar to those in the State of Colorado. Employment trends in the Denver PMSA and the State are shown in figure 2-7. An economic downturn began in 1986, but the economy now appears to be improving slightly. Total employment increased by 6.7 percent between 1987 and 1990. Unemployment rates, shown in figure 2-8, have declined since 1987. However, unemployment rates in the Denver PMSA are heavily influenced by net migration (the number of persons moving into an area less the number of persons moving out of an area). Net migration in the Denver PMSA is shown in figure 2-9. High net migration contributed to an increase in unemployment rates from 1981 to 1982 during times of economic expansion. Beginning in 1986, net migration in the Denver PMSA has been negative; i.e., more persons have left than entered. This resulted in lower unemployment rates than would have otherwise occurred.

FIGURE 2-7

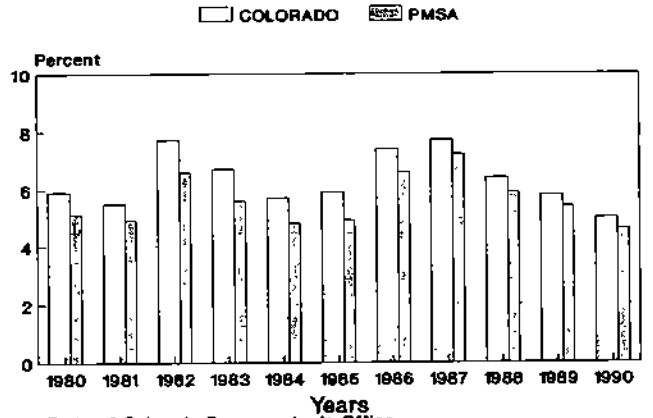
CIVILIAN LABOR FORCE AND EMPLOYMENT



Source: State of Colorado Demographer's Office

FIGURE 2-8

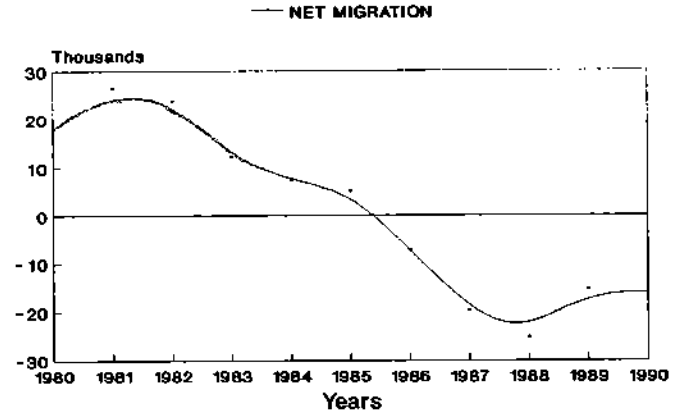
UNEMPLOYMENT RATES



Source: State of Colorado Demographer's Office
Unemployment as a percent of civilian labor force

FIGURE 2-9

NET MIGRATION IN THE DENVER PMSA



Source: State of Colorado Demographer's Office

Because most visitors to Cherry Creek Lake are Denver PMSA residents, economic downturns have not resulted in reduced visitation. Poor economic conditions may have actually resulted in increased visitation, as more Denver PMSA residents sought inexpensive local recreation opportunities. The decrease in net migration is reflected in the decline in Cherry Creek campground occupancy by transients looking for work in the Denver area.

SURROUNDING LAND USE

When the Cherry Creek Lake project was first constructed, the land surrounding the project was predominantly in agricultural use. The large population increases since 1950 in the Denver PMSA in general, and in Arapahoe County in particular, have resulted in the expansion of urban development into the northern portion of the Cherry Creek basin. Currently, the Cherry Creek Lake project is nearly surrounded by land uses which are predominantly residential (both single-family and multifamily) and commercial. The Denver Tech Center, a major office park, is located near Cherry Creek Lake, between the project and I-25.

Projections of population increases indicate increased development in the Cherry Creek basin. Increased development upstream from the project will likely result in increased erosion, sedimentation, and water quality problems on the project; reduced wildlife corridors between the project and other areas within the Denver PMSA; and increased demands for recreation use of project facilities and resources.

RELATED RECREATION, HISTORIC, AND SCIENTIFIC AREAS

Many recreation, historic, and scientific areas located in the five-county area of influence offer alternative outdoor recreation opportunities to potential visitors. The Cherry Creek Lake project is used primarily by day-use visitors who live in the Denver metropolitan area. Recreation activities similar to those offered at the Cherry Creek Lake project are also available at two other Corps projects in the Denver area, Chatfield Lake and Bear Creek Lake. However, the visitation survey conducted in 1984 and 1985 indicated that the primary areas of influence of the three reservoir projects differ and are based mainly on proximity to the project. Although the survey showed that the primary areas of influence for Chatfield Lake and Bear Creek Lake intersected, an indication of competition between the two projects, neither of these primary areas of influence intersected with that of Cherry Creek Lake. Visitors from Arapahoe and Denver Counties constitute the great majority at Cherry Creek Lake, whereas Jefferson County visitors are much more heavily represented at Chatfield and Bear Creek Lakes.

A wealth of outdoor recreation opportunities are available to residents of the Denver metropolitan area. The "Recreation Impact Assessment", prepared by Philip E. Flores Associates, Inc., and Hammer, Siler, George Associates in 1986 as part of the "Metropolitan Denver Water Supply Systemwide/ Site-Specific Environmental Impact Statement, Two Forks Reservoir (1.1 Million Acre-Feet)", indicates that only 10 percent of recreation trips to recreation areas managed by the DPOR involve destinations located more than a 2-hour drive from the recreator's residence. Within this distance from Denver, there are many reservoirs with over 500 surface acres and many public recreation areas that facilitate opportunities for stream fishing, whitewater rafting, downhill skiing, mountain or dirt biking, rock or mountain climbing, wilderness hiking, and primitive camping. Major public outdoor

recreation opportunities in the Denver area which, like Cherry Creek Lake, offer either developed campsites or a boat ramp are presented in table 2-6.

A number of outdoor tourist attractions are located 2 hours or less from Denver. These may be frequented by visitors from outside the Denver area on their way to or from Cherry Creek Lake and provide alternatives available to regular Cherry Creek Lake visitors. The outdoor attractions within the Denver PMSA, as well as numerous museums, cultural events, and sites which are listed in the NRHP, may also constitute side trips for campers at Cherry Creek Lake during inclement weather and/or to enhance the variety of their recreational experiences. Major outdoor tourist attractions within 2 hours of Denver are presented in table 2-7.

Table 2-6
Major Public Outdoor Recreation Sites Within 2 Hours of Denver Offering Either Boat Ramps or Developed Campsites

Site Name [1]	Owner [2]	County & State	Land Acres	Water Acres	Total Acres	Facilities Present: Camp-sites	Boat Ramp	Swim Area	Water-Ski
Antero Reservoir	DWD	Park, CO	3,656	1,944	5,600	X	X		
Arapaho National Forest (includes Arapahoe NRA/ Granby & Shadow Mountain Lakes in Grand County, CO	USFS	Clear Creek, Gilpin, Grand, Jackson, Routt, Jefferson, Park, & Summit, CO	na	na	1,009,000	X	X		X
Barbour Ponds SRA	State	Boulder, CO	50	80	130	X			
Barr Lake SP	State & LID	Adams, CO	691	1,918	2,609		X		
Bear Creek Lake Park	COE	Jefferson, CO	2,205	107	2,312	X	X		
Black Hollow Reservoir	LID	Weld, CO	na	580	na		X		
Boulder Reservoir	City of Boulder	Boulder, CO	na	600	na		X		
Boyd Lake SRA	State & LID	Larimer, CO	197	1,747	1,944	X	X	X	X
Carter Reservoir	BoR	Larimer, CO	na	1,140	na		X		
Chatfield Lake & SRA	COE	Douglas & Jefferson, CO	5,305	1,422	6,727	X	X	X	X
Cherry Creek Lake & SRA	COE	Arapahoe, CO	4,501	844	5,345	X	X	X	X
Curt Gowdy SP	State	Laramie, WY	na	na	1,118	X	X		X
Dillon Reservoir	DWD	Summit, CO	na	3,300	na	X	X		
Eleven-Mile Canyon Reservoir & SRA	DWD	Park, CO	3,912	3,308	7,220	X	X		
Golden Gate Canyon SP	State	Gilpin, CO	8,929	20	8,949	X			
Jackson Lake SRA	State & LID	Morgan, CO	427	1,940	2,367	X	X	X	X
Lake Pueblo SRA	State & BoR	Pueblo, CO	15,755	4,000	19,755	X	X	X	X
Lonetree Reservoir	LID	Larimer, CO	na	502	na		X		
Lory SP/Horsetooth Reservoir	State & BoR	Larimer, CO	2,419	1,800	4,219	X	X	X	X
Pawnee National Grassland	USFS	Weld, CO	na	na	192,647	X			
Pike National Forest	USFS	Clear Creek, El Paso, Douglas, Jefferson, Park & Teller, CO	na	na	1,110,372	X	X		
Rocky Mountain NP	NPS	Boulder, Grand & Larimer, CO	na	na	266,957	X			
Roosevelt National Forest	USFS	Boulder, Gilpin, Jefferson & Larimer, CO	na	na	782,000	X	X		
Spinney Mountain Reservoir	City of Aurora	Park, CO	2,780	2,520	5,300		X		
Standley Lake	City of West-minster & LID	Jefferson, CO	390	1,210	1,600		X		

[1] NP = National Park
NRA = National Recreation Area
SP = State Park
SRA = State Recreation Area

[2] BoR = Bureau of Reclamation
COE = Corps of Engineers
DWD = Denver Water Department
LID = Local Irrigation District
NPS = National Park Service
USFS = U.S. Forest Service

Table 2-7
Major Outdoor Tourist Attractions Within 2 Hours of Denver

Attraction	County and State	Type of Site
Bear Creek Nature Center, Colorado Springs	El Paso, CO	Biological
Buckskin Joe Mining Town, Canon City	Fremont, CO	Historical
Cave of the Winds, Manitou Springs	El Paso, CO	Geological
Centennial Village, Greeley	Weld, CO	Architectural, Cultural, Historical
Cheyenne Mountain Zoological Park, Colorado Springs	El Paso, CO	Zoological
Cripple Creek Historic District, Cripple Creek	Teller, CO	Historical
Denver Botanic Gardens, Denver	Denver, CO	Botanical
Denver Zoo, Denver	Denver, CO	Zoological
Elitch Gardens Amusement Park, Denver	Denver, CO	Recreational
Florissant Fossil Beds National Monument	Teller, CO	Geological, Paleontological
Fort Vasquez, Platteville	Weld, CO	Historical
Frontier Park Arena, Cheyenne	Laramie, WY	Cultural, Recreational
Garden of the Gods Park, Colorado Springs	El Paso, CO	Geological
Georgetown Loop Historic Mining Area, Georgetown	Clear Creek, CO	Historical, Technological
Heritage Square, Golden	Jefferson, CO	Cultural, Historical, Recreational
Hyland Hills Water World, Federal Heights	Jefferson, CO	Recreational
Littleton Historical Museum, Littleton	Arapahoe, CO	Historical
Mollie Kathleen Gold Mine, Cripple Creek	Teller, CO	Geological
Peterson Space Command Museum, Colorado Springs	El Paso, CO	Aeronautical
Pueblo Zoological Park, Pueblo	Pueblo, CO	Zoological
South Park City Museum, Fairplay	Park, CO	Historical
State Capitol, Cheyenne	Laramie, WY	Architectural
State Capitol, Denver	Denver, CO	Architectural
State Fish Hatchery, Bellvue	Larimer, CO	Piscicultural
United States Air Force Academy, Colorado Springs	El Paso, CO	Cultural
White House Ranch Historic Site, Colorado Springs	El Paso, CO	Historical

RECREATION DEMANDS AND TRENDS

Cherry Creek Lake is experiencing increased visitation demands common to reservoirs surrounded by urban development in large metropolitan areas. These increased demands are expected to continue for several reasons.

POPULATION

Increased outdoor recreation demands in the Denver area are anticipated because the population of the Denver area is expected to continue to increase. Preliminary 1990 census data presented in table 2-4 show that the population of the Denver PMSA grew by 29.1 percent between 1970 and 1980 and grew 13.6 percent between 1980 and 1990. For Arapahoe and Denver Counties, from which Cherry Creek Lake draws the bulk of its visitation, the rate of growth declined only slightly, from 15.8 percent (between 1970 and 1980) to 9.6 percent (between 1980 and 1990).

National demographic characteristics and analyses of trends in outdoor recreation demands were provided in the NPS's "1982-1983 Nationwide Recreation Survey." The general conclusions and their applicability to recreation opportunities at Cherry Creek Lake are presented below.

AGE

Age is a major factor affecting both participation in and the amount of money spent on outdoor recreation. These trends are shown in table 2-8.

Table 2-8
Outdoor Recreation Participation and Expenditures
by Age Category, 1982-1983

Age Group (years)	No. of Activities	Activity Days Per Year[1/]	Yearly Expenditure	Expense per Activity Day
12-24	10	60	$236	$ 3.93
25-39	8	40	375	9.38
40-59	6	27	413	15.30
60 and over	3	12	391	32.58

1/ An activity day represents one visitor participating in a particular recreation activity one or more times at one or more areas of a project for any length of time during a 24-hour period.

Although recreation involvement tends to decline steadily throughout adulthood, the amount of money spent on outdoor recreation does not. Persons 60 or older spent more than twice as much money per activity day than those in the 40-59 year age group.

This relationship is demonstrated by camping expenditures. Elderly campers tend to have a moderate to high investment in camping equipment. Camping appears to be a prominent activity among the senior citizens who visit Cherry Creek Lake. The 1982 user survey conducted by the Colorado DPOR revealed that although only 8.2 percent of visitors to the Cherry Creek Lake SRA entered by using the Aspen Leaf passes, which are issued to Colorado citizens who are at least 62 years old, at least 20 percent of the campers held Aspen Leaf passes.

Research indicates that holders of Golden Age or Golden Access passports, which are issued by the Corps to persons who are at least 62 years of age or disabled, are much more likely to use electrical hookups. In "Summary of the 1984 Campground Receipt Study," Waterways Experiment Station Miscellaneous Paper R-86-1, comparisons are made between camping parties with Golden Age/Access passports versus standard entry permits. Nationwide, the Golden Age/Access passport camping parties were three times as likely to use motor homes or travel trailers

but only one-ninth as likely to camp in tents as the campers with standard entry permits. To meet public needs and desires, the addition of electrical hookups to some campground loops will be considered.

The median age of the Denver PMSA, the five-county area of influence for Cherry Creek Lake, increased from approximately 29 years in 1980 to approximately 30 years in 1984. User surveys conducted at the Cherry Creek SRA by the Colorado DPOR indicate that the average age of the Cherry Creek Lake visitor is also increasing. The percentage of visitors 19 to 44 years old increased from 39.6 percent in 1978 to 54.5 percent in 1982. This increase is explained not only by the aging of the population in the residential communities in the vicinity of Cherry Creek Lake but also by the increase in weekday use by people who work in one of the many offices recently constructed near Cherry Creek Lake.

Although increases in the age of the average user at Cherry Creek Lake may result in shifts in popularity among activities, the total demand for outdoor recreation at Cherry Creek Lake may not decrease. The results of a study conducted by Market Opinion Research in 1986, "Participation in Outdoor Recreation Among American Adults and the Motivations Which Drive Participation," is included in "Working Papers: The President's Commission on Americans Outdoors," published in December 1986. This study concluded that a majority of American adults aged 18 and over consider themselves "outdoors" people. Members of the "baby boom" generation, born from 1946 to 1961, are predominantly individuals with active outdoor lifestyles. Because they constitute 38 percent of all adults, their interests greatly influence general trends. Although the eldest of the baby boomers are at an age when participation in active outdoor sports begins to decline, more of them continue participating in outdoor recreation than the previous generation did at that age. In the future, elderly baby boomers will probably place more demands on outdoor recreation facilities than those in older age groups do now.

INCOME

Based on this factor, the population in the Denver PMSA would be expected to have higher-than-average demands for outdoor recreation.

The 1982-1983 NPS survey indicated that outdoor recreation participation tends to rise with increasing family income, but the impact of income on outdoor recreation participation did not become substantial until family income exceeded $15,000. Compared with families earning less than $15,000 per year, families earning $15,000 to $25,000 per year spent 44 percent more time in outdoor recreation activities; families earning over $25,000 per year spent even more time than that.

The median family income in 1979 in the Denver PMSA was over $23,000. This was far above the $15,000 "threshhold" and considerably above the 1979 national median of $19,917.

Although the economic recession in the Denver area has resulted in a slight reduction in real per capita income in the five-county area between 1979 and 1985, the per capita money income in the Denver PMSA was still approximately 20 percent greater than the national average. Visitation at Cherry Creek Lake during the 1980's does not appear to have been reduced because of reductions in income. The recession may have even increased outdoor recreation demands at Cherry Creek Lake for Denver area residents because travel costs to Cherry Creek Lake are lower than costs to more distant outdoor recreation destinations.

EDUCATION

Based on this factor, residents of the Denver PMSA would be expected to engage in outdoor recreation pursuits at levels higher than the national average and at an increasing rate of participation.

The 1982-1983 NPS survey showed that participation in outdoor recreation rises with increasing levels of education. High school

graduates spent over twice as many days and college graduates over three times as many days in outdoor recreation activities as those who did not graduate from high school.

The educational level attained by residents of the Denver PMSA increased dramatically between 1970 and 1980. The percentage of adults at least 25 years of age who had graduated from high school increased from over 66 percent in 1970 to 80 percent in 1980. The percentage of adults at least 25 years of age who had completed 4 or more years of college increased by one-half, from 16 percent to almost 25 percent, between 1970 and 1980. By comparison, the educational attainment in the United States as a whole in 1980 was almost identical to that which existed in the Denver PMSA in 1970.

LEISURE TIME

According to the 1982-1983 NPS survey, the most frequently cited constraint on outdoor recreation participation was lack of time, followed by lack of money. Four times as many persons surveyed anticipated an increase in the amount of time spent on outdoor recreation in the next 2 years as those who anticipated a decrease. These survey results indicate that outdoor recreation participation in general will increase.

Increases in the amounts of leisure time and the increasing proportion of that leisure time which is being devoted to outdoor recreation has increased demands for outdoor recreation resources nationally and at Cherry Creek Lake. Early retirement has become increasingly common, thus creating more leisure time for Americans still young enough to engage in many active outdoor pursuits. According to the 1986 survey conducted for the President's Commission on Americans Outdoors, vacations are also increasing among those still in the work force. Seventy-five percent of American adults took at least one week-long vacation in 1985, and 85 percent took mini-vacations of several days or a long weekend. Three out of 10 adults in the 1986 survey took six or more mini-vacations in 1985.

VISITATION

ANNUAL PROJECT VISITATION

Visitation at Cherry Creek Lake was recorded beginning on 17 June 1959, after a park and recreation lease was executed with the State of Colorado DPOR. Visitation to Cherry Creek Lake has grown tremendously over the years. This growth in visitation is a reflection of the increased population in the Denver metropolitan area, extensive development in the vicinity of the project, and construction of recreation facilities to accommodate demand for outdoor-recreation opportunities. Table 2-9 shows the visitation from the years 1959 through 1990.

Over the years, the Corps has reported visitation by several different methods. Prior to 1988, visitation was reported in terms of "recreation days of use," also termed "recreation days." Each recreation day represented one person who entered the project to pursue one or more activities at one or more areas within that project during a 24-hour period. In 1986, visitation began to be reported also by "visitor hours." Visitor hours represent the number of hours spent at a project by persons entering that project to pursue one or more recreation activities. Visitor hours can not be directly translated into recreation days. In 1988, project visitation data were recorded by the Corps only in terms of visitor hours. In 1989, there were two changes in Corps visitation reports. First, the Corps began reporting visitation by fiscal year (FY) rather than calendar year; FY 1989 covers the period from 1 October 1988 through 30 September 1989. Second, visitation began to be reported in terms of "visits" in addition to visitor hours. A visit is defined as one person visiting the project for recreation purposes for any period of time.

Table 2-9
Visitation at Cherry Creek Lake Project, 1959-1990

Year	Recreation Days	Visitor-Hours	Visits
1959	168,700	n.a.	n.a.
1960	399,325	n.a.	n.a.
1961	551,000	n.a.	n.a.
1962	757,000	n.a.	n.a.
1963	687,367	n.a.	n.a.
1964	946,852	n.a.	n.a.
1965	459,800 1/	n.a.	n.a.
1966	480,100	n.a.	n.a.
1967	470,029	n.a.	n.a.
1968	694,996	n.a.	n.a.
1969	888,962	n.a.	n.a.
1970	957,125	n.a.	n.a.
1971	910,200	n.a.	n.a.
1972	985,100	n.a.	n.a.
1973	990,700	n.a.	n.a.
1974	1,094,130	n.a.	n.a.
1975	1,167,360 2/	n.a.	n.a.
1976	1,232,970 2/	n.a.	n.a.
1977	1,429,120 3/	n.a.	n.a.
1978	1,100,805 4/	n.a.	n.a.
1979	1,219,000	n.a.	n.a.
1980	1,243,150	n.a.	n.a.
1981	1,814,800	n.a.	n.a.
1982	1,545,100 5/	n.a.	n.a.
1983	1,719,200	n.a.	n.a.
1984	1,639,600 6/	n.a.	n.a.
1985	1,606,900	n.a.	n.a.
1986	1,704,800	5,796,300	n.a.
1987	1,779,400	6,049,900	n.a.
1988	n.a.	6,778,200	n.a.
FY 1989	n.a.	6,615,300 7/	1,564,528
FY 1990	n.a.	6,910,800	1,695,800

1/ Reduced visitation due to initiation of park entrance fees and inundated facilities when high inflows produced a high pool elevation.

2/ Boating was shut down because of low water levels.

3/ Carrying capacity controls were initiated by DPOR for Cherry Creek SRA as a whole in midseason.

4/ Apparent decrease in visitation because of change in DPOR estimate of persons per vehicle, from 4.3 down to 3.4.

5/ Apparent decrease in visitation because of change in DPOR estimate of persons per vehicle, from 3.4 down to 3.0.

6/ Decrease because of DPOR initiation of carrying capacity controls for each facility area at the SRA.

7/ Decrease partly because of initiation of a reservoir user fee of $3 per year for each vehicle entering the SRA to fund CCBWQA efforts to improve water quality in Cherry Creek Lake.

VISITOR DISTRIBUTION

Approximately three-fourths of the project visitation is currently accounted for by the Cherry Creek SRA (also known as the East Shore and West Shore), the portion of the project leased to the Colorado DPOR. June is the busiest month at the SRA, and SRA visitation averages approximately 8,000 people per day during June and July. Springtime visitation at the SRA is high because of cool weather and melting snow in the mountains at this time. From mid-April until mid-August, the SRA visitation reaches carrying capacity on every holiday, on weekends, and even on some weekdays. At the SRA, day users average nearly 5 hours per visit and campers average 4 nights per stay.

The remaining one-fourth of the visitation occurs at J.F. Kennedy Park and Golf Course, leased by the City and County of Denver; Village Greens Park, leased by the City of Greenwood Village; and Olympic and Crestridge Parks, leased by the City of Aurora. Visitors to these areas average nearly 3 hours per visit. It is anticipated that the planned future expansion of recreation facilities at Village Greens and Olympic Park will result in increased annual visitation to these areas.

Visitation data for all recreation areas at the Cherry Creek Lake project in FY 1990 are presented in table 2-10.

Table 2-10
Visitation at Recreation Areas, Cherry Creek Lake Project, FY 1990

Recreation Area	Visitor Hours	Percent of Total Hours	Visits	Percent of Total Visits
SRA (Total)	5,721,800	83	1,248,500	74
J.F. Kennedy Park	750,200	11	226,600	13
Village Greens Park	259,300	4	101,000	6
Olympic and Crestridge Parks	179,500	3	119,700	7
TOTAL	6,910,800	101 [1/]	1,695,800	100

[1/] Percents do not add to 100 because of rounding.

CARRYING CAPACITY

The carrying capacity of a recreation resource--land, water, and facilities--is the maximum level of use that does not exceed either the resource capacity (level of use beyond which degradation of the physical environment takes place) or the social capacity (level of use beyond which the recreator does not achieve a reasonable level of satisfaction).

To relieve overcrowding, the DPOR developed and implemented a program in 1977 to restrict visitation to the Cherry Creek SRA whenever carrying capacity for the SRA as a whole was reached. User surveys were conducted by the DPOR at Cherry Creek SRA in 1978, 1981, and 1982. Crowding was perceived as a problem by only 13 percent of the users in 1978, the year after carrying capacity controls were first implemented, but by 50 percent of the users in 1981. The 1982 survey included several questions specific to the crowding situation. Of all users surveyed, 65 percent felt that the lake was crowded with boats, 64 percent supported continuing to zone water uses, and 49 percent felt that the swim beach was crowded. To deal with the crowding, the establishment of a facility capacity and the establishment of a park capacity were supported by 91 and 85 percent, respectively, of all users in the 1982 survey.

Separate carrying capacity programs for boating and for land-based facilities were developed by the DPOR in 1983 and implemented in 1984. The carrying capacity of each activity area of the SRA and of the entire SRA was determined based on factors of safety, social capacity, and resource capacity. The amount of parking available for an activity area was adjusted to reflect the carrying capacity of that area. When an activity area reaches capacity, additional visitors are allowed to enter that area only as current visitors leave. Activity areas which often reach capacity are the east and west boat ramps, the swim beach, the 12 Mile House group picnic area, the east side shade shelters, and the west side shade shelters.

When the SRA reaches carrying capacity, it is "closed" by the DPOR; no new visitors in vehicles are admitted until some current visitors have left. Such closures are announced on major radio stations throughout the State. The SRA generally reaches carrying capacity on most weekend days and some weekdays between mid-April and mid-August. Carrying capacity controls generally exist from approximately 11 a.m. until approximately 3 p.m. Some recreators wait in line up to 3 hours to enter Cherry Creek SRA.

Trail use is included in the SRA carrying capacity determinations, and vehicular entry by persons who primarily intend to ride horses, hike, or bicycle is subject to carrying capacity controls. However, it is impractical to restrict SRA visitors who enter by nonvehicular uncontrolled access points, primarily the bicycle and equestrian trails. Carrying capacity controls have resulted in greater increases in this type of visitation than would otherwise have occurred.

Carrying capacity controls have brought other changes to the SRA. A new, longer east entrance road was constructed in 1983 to accommodate the vehicle lines. A separate entrance road to the campground is proposed to enable registered campers, who have already been included in the park carrying capacity, to avoid the vehicle lines. Visitation during weekdays or during the early morning or late afternoon hours on weekends has increased, resulting in a more even distribution of visitation between peak and nonpeak hours. New facilities to increase the carrying capacity of the SRA have recently been developed by the DPOR or are proposed in this Master Plan. However, the DPOR's policy is that expansion of intensive recreation facilities will be limited to allow at least 60 percent of the SRA to be available for low-density recreation.

Activities at J.F. Kennedy Park, Village Greens Park, Olympic Park, and Crestridge Park consist primarily of golf, soccer, tennis, baseball, and softball. Use of facilities for these activities is scheduled by

the lessees in a manner which does not exceed the carrying capacity of the facilities.

ACTIVITY MIX

The annual activity mix at Cherry Creek Lake was derived from Corps Natural Resource Management System (NRMS) data and information provided by lessees for fiscal year 1990. Two activity mixes for Cherry Creek Lake have been calculated. One is based on visitor hours, and one is based on activity days. Each activity participated in during a recreation day is considered an activity day. The activity mix based on activity days exceeds 100 percent because many visitors participate in more than one recreation activity during a single day's visit. The annual activity mixes and the data from which they are derived are presented in table 2-11.

Table 2-11
FY 1990 Activity Mix Data
Cherry Creek Lake, Colorado

Activity	Rec. Days of Use (Primary Activities)	Secondary Activity Days	Hours /Day	Subtotal Hours (Specific Activities)	Total Hours (General Activities)	Activity Mix (% of Hours)	Total Activity Days	Activity Mix (% of Rec. Days)
Fishing: Total					1,813,683	26.2%	363,157	21.4%
Shore/Ice Fishing	330,720		5.0	1,653,600				
(Campers)		2,102	4.0	8,408				
Boat Fishing	30,335		5.0	151,675				
Boating: Total					720,351	10.4%	171,176	10.1%
Nonmotor or Ice Boating	40,171		3.5	140,599				
(Campers)		2,102	4.0	8,408				
Motorized Boating	30,440		5.0	152,200				
(Boat Fishermen)		30,335	6.0	182,010				
(Water-Skiers)		65,500	3.5	229,250				
(Campers)		2,628	3.0	7,884				
Waterskiing	65,500		3.5	229,250	229,250	3.3%	65,500	3.9%
Swimming: Total					930,049	13.5%	188,112	11.1%
Swimming: Primary	177,601		5.0	888,005				
(Campers)		10,511	4.0	42,044				
Picnicking: Total					527,367	7.6%	526,041	31.0%
Picnicking: Primary	124,504		2.0	249,008				
(Model Aircraft Flyers)		8,804	0.5	4,402				
(Boat Fishermen)		20,223	0.5	10,112				
(Shore Fishermen)		110,240	0.5	55,120				
(Swim Beach Users)		142,081	1.0	142,081				
(Boaters/Water-Skiers)		13,100	1.0	13,100				
(Bicyclists)		33,956	0.5	16,978				
(Other Trail Users)		73,134	0.5	36,567				
Camping	21,022		16.0	336,352	336,352	4.9%	21,022	1.2%
Sightseeing	109,510		2.0	219,020	219,020	3.2%	109,510	6.5%
Ball/Golf/Tennis: Total					1,189,025	17.2%	447,311	26.4%
JFK Golf Course, May-Oct	93,657		5.3	496,382				
JFK Golf Course, Nov-Apr	25,926		3.6	93,334				
JFK Soccer & Ball Fields	107,000		1.5	160,500				
Village Greens, May-Oct	65,376		3.0	196,128				
Village Greens, Nov-Jan	8,174		1.0	8,174				
Village Greens, Feb-Apr	27,481		2.0	54,962				
Olympic/Crestridge Parks	119,697		1.5	179,546				
Trail Activities: Total					803,133	11.6%	509,405	30.0%
Horseback Riding	6,574		2.5	16,435				
Hiking: Primary	107,380		2.0	214,760				
(Other Day Users)		218,964	1.0	218,964				
(Campers)		10,511	2.0	21,022				
Bicycling	135,822		2.0	271,644				
Nature Trail Use	22,899		2.0	45,798				
Nature Interpretation	7,255		2.0	14,510				
Other Activities: Total					142,571	2.1%	38,714	2.3%
Model Aircraft Flying	17,607		5.0	88,035				
Dog Trial Area Use	12,629		3.0	37,887				
Winter Sports	615		1.5	923				
Rifle Range Use	7,863		2.0	15,726				
TOTAL	1,695,758	744,190		6,910,800	6,910,800	100.0%	2,439,948	143.9%

( ) indicates primary activity of persons participating in a secondary activity

RECREATION FACILITIES

Recreation facilities at the Cherry Creek Lake project are many and varied. The existing recreation facilities at the various areas of the project which afford recreation opportunities are listed in table 2-12. The location of the recreation areas are shown on the Facility Locations map, plate 11. The identification number for each area in the table corresponds to its number on the map.

The list includes facilities for which construction was initiated in 1989 and does not necessarily agree with the facilities listed in the NRMS inventory. Facilities proposed for development within 5 years are also identified in table 2-12. These facilities are shown in detail on the Development Plan, plates 5 through 9.

Table 2-12
Recreation Facilities
Cherry Creek Lake, Colorado [1/]

Area No.	Area Name	Car Parking	Boat Parking	Toilet Facilities	Potable Water	Picnic Sites	Picnic Shelters	Group Shelters	Play-ground	Other Facilities
1	J.F. Kennedy Golf Course									3 golf holes
2	J.F. Kennedy Soccer Complex	150, P		2C						2+P soccer fields
3	Village Greene Park	305		1F	Y				Y	food concession
5	Marina Area	146	69	1F	Y		4			149 slips, 4 docks, volleyball court, marina concession
6	West Side Picnic Area	96, P		1F, 1FP, 2V	Y		10	2, 1P	P	4 boat ramp lanes
7	Mountain Loop	23		1V						
8	Lake Loop/Prairie Dog Area	131		1FP, 2V	P	14	P			sailboard concession, volleyball court
9-10	Prairie Loop/Nature Trail	15				2	P			0.75-mile nature trail
11	SRA Open Space Area	15								existing & P bicycle & equestrian trails
12	Model Airplane Field	45		1V		5	2			2 runways
15	Rifle Range	100		1V						outdoor shooting ranges, P archery range
16	Mountain Bike Trailhead	12		1C			1			0.5-mile hiking trail
17	Dog Trial Area	100		1V						
18	12 Mile House Group Picnic Area	41, P		1F, 1FP, 1V	Y			1, 1P	Y	volleyball court
20	Horse Stables	25		1C	Y	1	1			stable, 3 corrals
22	East Side Boat Ramp Area	8, P	82	1V			1			4 boat ramp lanes, dock, jet-ski concession
23	East Side Shade Shelter Area	91, 2H		1V			11			H fishing pier
24	Swimbeach Complex	472		1F	Y	12	1	1	Y	swim beach, ski beach, showerhouse, volleyball court, food concession
25	Campground			3F, FP	Y		6, P			102 pads, 5 group campsites, washhouse, showerhouse, amphitheater, dump station
28	South Spillway Area									maintenance compound, P trail
30	Olympic Park	241, P		1F, 1FP	Y		P		P	4+P ball fields, 3+P soccer fields, P trail, food concession
31	Crestridge Park								Y	2 tennis courts
32	North Spillway Area									no facilities
34	Dixon Grove	103		1FP, 1V, 1VH	Y	32				jetty with H fishing pods
35	Tower Loop	55		1FP, 1V	Y	2	P			P fish cleaning station
37	Dam Embankment	10								
38	J.F. Kennedy Ballfield Complex	200, P		1F, 1FP	Y	P			P	4+P ball fields, P bicycle trail, food conc.

1/ P = new or additional facilities proposed
H = handicapped-accessible facility
Y = facility available
F = flush comfort station
C = chemical toilet
V = vault toilet

RECREATION ACTIVITIES AND NEEDS

A variety of outdoor recreation activities is available at the Cherry Creek Lake project. Based on the activity mix presented as table 2-11, approximately one-half of the visitors to the project engage in water-based recreation activities, one-fourth use the sports fields and golf course, and one-fourth participate in other land-based outdoor recreation activities. Specific activities, activity trends, and facility modifications to meet projected needs are discussed in the following paragraphs. The primary activities of visitors to the Cherry Creek SRA between 1984 and 1988 are presented as table 2-13, and the recent recreation activity trend data which it contains are interpreted in the remainder of this section. Recreation needs based on this trend data formed the basis for the 1989-1990 recreation facility construction program and for resource use policies and facility development proposed in this Master Plan. Trends shown by 1988 data continued in 1989 and 1990.

Table 2-13
Total Visitors and Primary Activities
Cherry Creek SRA

	1984	1985	1986	1987	1988
Primary Activities - 1 Per Recreation Day					
Sightseeing	223,411	139,784	151,812	138,037	147,149
Swimming	159,870	182,118	174,183	169,317	196,732
Shore/Ice Fishing	304,773	308,770	319,210	360,530	377,982
Horseback Riding	4,457	6,610	8,375	8,614	7,151
Hiking/Jogging	145,330	164,040	160,873	135,646	111,762
Bicycling	58,438	50,798	69,248	101,046	107,688
Picnicking	184,232	169,770	170,796	142,777	130,442
Boat Fishing	17,189	23,212	21,929	24,449	48,821
Nonmotor Boating/Ice Boating	33,485	35,133	38,266	48,417	45,669
Waterskiing	22,812	37,038	28,501	42,165	67,257
Motorized Boating	24,156	29,034	45,007	39,702	47,083
Nature Trails	37,557	23,837	23,174	22,050	24,129
Interpretive Programs	2,862	4,576	5,336	4,762	3,225
Camping	22,924	19,821	16,154	16,249	16,879
Model Aircraft Flying	42,603	32,625	31,782	19,558	18,796
Dog Trail Area Use	17,830	19,911	22,345	17,955	15,918
Winter Sports (Ice Skating, Sledding, Cross-Country Skiing, etc.)	8,410	1,343	2,464	983	948
Rifle Range	10,586	9,035	8,127	9,021	9,366
TOTAL	1,320,925	1,257,455	1,297,582	1,301,278	1,376,997

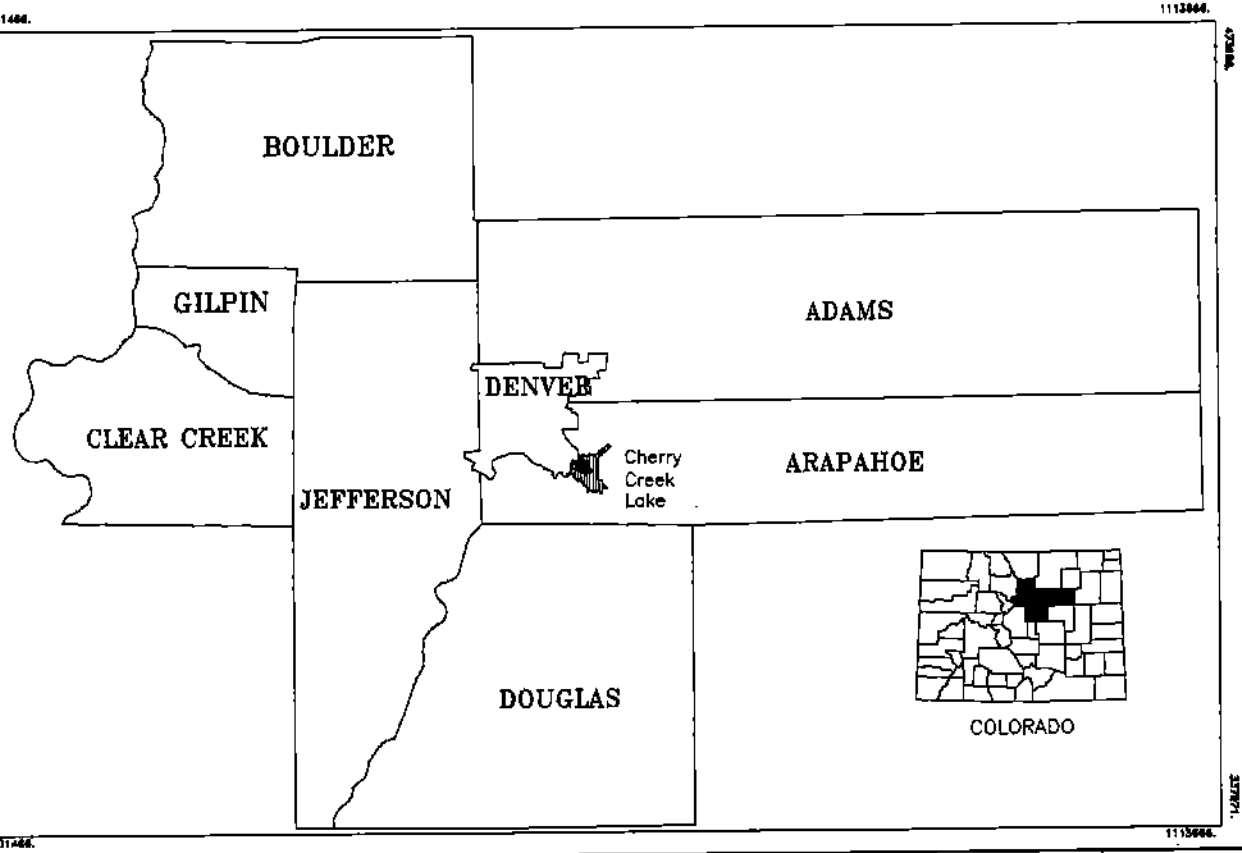
BOATING

Boating activities at Cherry Creek Lake more than doubled between 1984 and 1988. The 1986 Colorado Statewide Comprehensive Outdoor Recreation Plan (SCORP) categorized the need for additional facilities for pleasure boating, waterskiing, sailing, and boat fishing as "medium" in Region 3 (the eight-county Denver metropolitan area), which is shown in figure 2-10. Boating activities at Cherry Creek Lake have been able to increase to meet recreation needs because an increasing percentage of boaters are using the lake on weekdays rather than weekends, because special events such as regattas have been scheduled for weekdays rather than weekends, and because the use of the water has been maximized through zoning.

Because of its location within the Denver urbanized area, Cherry Creek Lake has a higher density of boats per acre than any other reservoir in Colorado. To reduce user conflicts, the DPOR has zoned large portions of the lake for no-wake boating or waterskiing. These water use zones are shown in figure 2-11. The carrying capacity of the lake has been determined by the DPOR to be 350 boats simultaneously, including cartop boats, sailboards, and boats based at the marina. To enforce this limit, the DPOR only allows boat-trailer parking at designated lots near the boat ramps or the Lake Loop sailboard beach.

Carrying capacity controls and water use zoning have been effective in minimizing the number of boating accidents (involving collisions or personal injuries) at Cherry Creek SRA to only 20 per year in spite of the increase in boaters. The continued increase in boating use after the implementation of carrying capacity restrictions has occurred primarily through increases in use during off-peak hours--early in the morning, in the evening, and on week days.

Powerboating. The number of persons engaging in motorized boating at Cherry Creek Lake in 1988 was triple the 1977 figure and double the 1984 figure. Above-average precipitation in the years 1983 through 1988



U.S.ARMY CORPS OF ENGINEERS

$$— THINK VALUE ENGINEERING —$$

CHERRY CREEK LAKE
MASTER PLAN
COLORADO SCORP REGION 3

FIGURE 2-10

FIGURE 2-10

Water Use Zones

— Notice to Boaters —

CHERRY CREEK
State Recreation Area

ASK US FOR ASSISTANCE
ENJOY YOUR VISIT

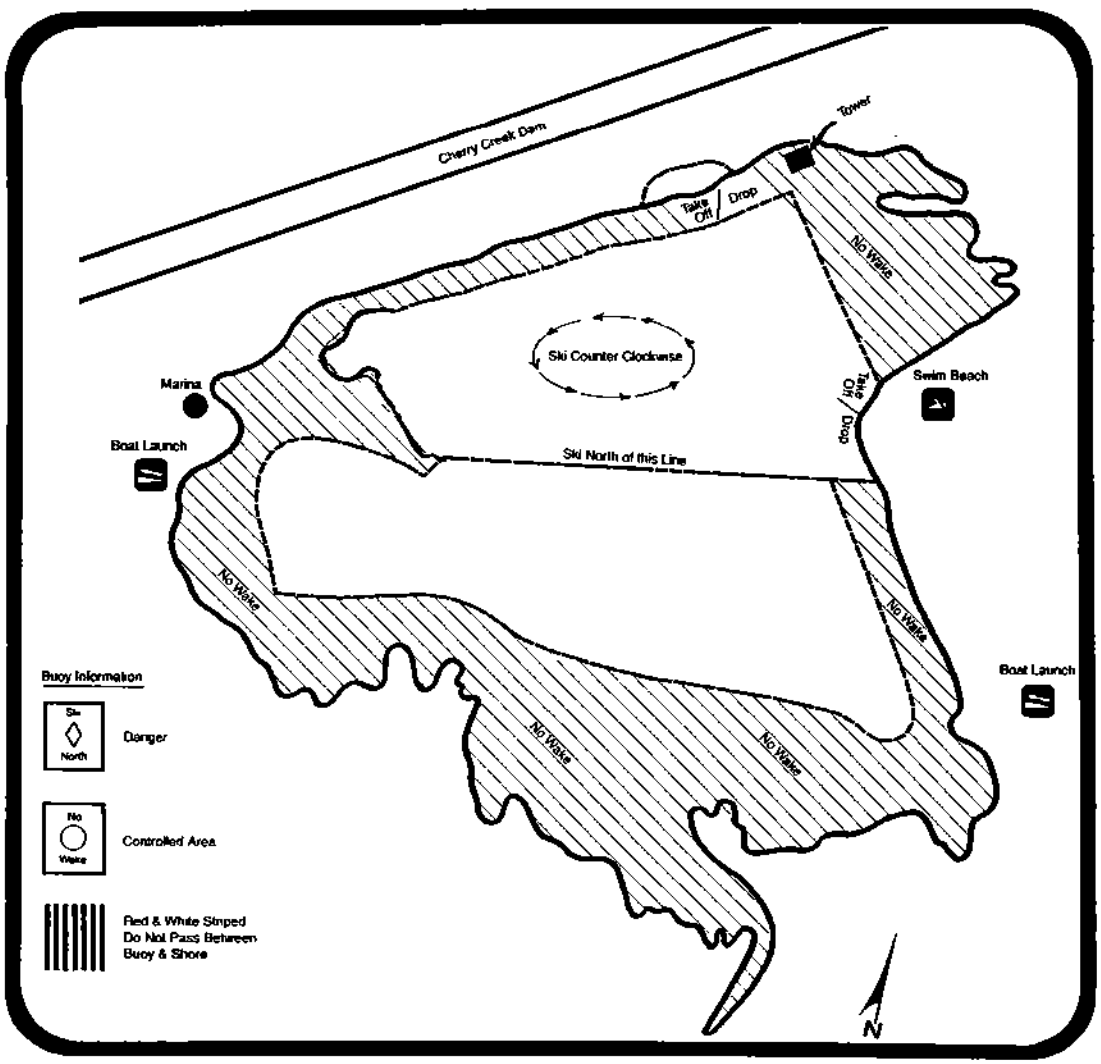


FIGURE 2-11

caused the level of the multipurpose pool to remain relatively high. These relatively high lake levels and the existence of good boating facilities have increased powerboating demands at Cherry Creek Lake. Powerboating requires large monetary outlays. The increasing age and affluence of the residents in the project's primary area of influence will tend to increase the demands for these activities at Cherry Creek Lake if the lake level remains high.

Most of the powerboats are launched from the two two-lane east boat ramps in the late morning and in the afternoon. The northern east boat ramp is experiencing siltation problems, and the southern east boat ramp requires resurfacing. These problems could be solved and increased boating needs could be met by widening the southern east boat ramp to four lanes, resurfacing it, and removing the northern east boat ramp; and by enforcing regulations at the east ramp parking lot, which is designated to accommodate only vehicles towing boat trailers.

Waterskiing. The number of water-skiers at Cherry Creek Lake nearly tripled between 1984 and 1988. The ratio of water-skiers to powerboaters has increased, indicating that the number of people per powerboat has increased and that more of the powerboaters are waterskiing.

Efficient water-use zoning and intensive management has enabled the number of water-skiers to increase without major accidents. A water-ski beach is located north of the east side shade shelters. Water-skiers take off from the northern half of the ski beach, water-ski in a counterclockwise direction, and are dropped off in the southern half of the ski beach.

Jetskiing. Jetskiing has also increased in popularity in recent years. Jet-ski rentals from a concession have added to the number of jet-skiers at Cherry Creek Lake. The concession was originally located in a small portable building near the handicapped fishing pier, north of

the northern east boat ramp. In 1989, the portable building was moved to a site south of the southern east boat ramp. The relocation was necessary to reduce water traffic congestion in the vicinity of the east boat ramps and to reduce the impact of jet-ski waves on shoreline erosion at the east side shade shelters, located north of the handicapped fishing pier. To meet the needs of jet-skiers, the concessionaire replaced the small portable building with a larger building, which will remain on the site year-round.

Sailing. Many Cherry Creek Lake boaters switched from nonmotorized to motorized boats between 1984 and 1988. However, the number of visitors engaging in nonmotorized boating increased by one-third between 1984 and 1988 because of a tremendous increase in sailboating and sailboarding (windsurfing). Often 200 sailboats and sailboards use the lake on a weekend day.

- Sailboating - Regattas are scheduled for sailboats and hobie cats in the area of the lake lying south of the marina. The three-lane west boat ramp, used mainly for launching sailboats, often reached capacity by 8 a.m. on Sunday mornings during the summer. In 1988, the west boat ramp was barely usable because of siltation. In 1989, the DPOR constructed a new four-lane concrete boat ramp adjacent to the old three-lane ramp and removed the old ramp to rectify this situation. The new ramp is longer than, and extends to a lower elevation than, the old ramp to facilitate boating use during low lake levels. It will also be relatively easy to remove silt deposits from the surface of the new ramp.

- Sailboarding - A sailboard beach with a sailboard rental concession building was established in 1986 adjacent to Lake Loop, one of the fishing loops on the west side of the lake, to serve the increasing number of sailboarders and reduce conflicts with other lake users. After the sailboard area was established, sailboarding activities further increased, and the sailboard beach area reaches

capacity almost every summer evening. To meet these growing needs, the sailboard beach facilities were expanded prior to the 1988 sailboarding season; the DPOR constructed a vault toilet and the concessionaire constructed an additional building for public storage of sailboards and sculls. If sailboarding continues to grow in popularity at Cherry Creek Lake, a flush comfort station and expanded concession facilities will be considered.

Marina Use. The 149 marina slips are fully rented, and typically 10 percent of the boats moored in the marina are in use on a summer weekend day. Many people scull or windsurf on their lunch hours, before work, or after work. These recreators and owners of boats who spend a night in their boats while the boats are moored in the marina expressed an interest in the addition of shower facilities to the marina area. "The Sails" building, which was constructed in 1967, contained toilet facilities, a snack bar, and office space. The marina concession building is on a floating dock in the marina because of "The Sails" building's structural problems and lack of adequate concession space. The toilet facilities in "The Sails" building were open only during warm weather because they were not heated, and portable chemical toilets were often inadequate to meet visitor needs during the spring and fall.

To better meet visitor needs, the DPOR rehabilitated "The Sails" building in 1989. Space heating and a new sewer lift station were installed, and the toilet facilities were expanded to include showers. A new food concession building and picnic shelters were constructed near "The Sails" building. In response to numerous requests for dry boat storage, the marina concessionaire may provide this service in and adjacent to the currently vacant Federal Research Facility buildings after the DPOR resumes management of that area.

Boat Fishing. The number of persons fishing from boats at Cherry Creek Lake nearly tripled between 1984 and 1988. Boat fishing has increased in spite of carrying capacity controls because the percentage

of boat fishing occurring on weekdays and during nonpeak hours on weekends has increased. Most fishing from boats takes place in the mornings and evenings, when fishing success is greatest. Most boat fishermen launch from the east boat ramps, where powerboaters concentrate launchings from late morning through late afternoon. On summer weekends, when powerboat traffic is heavier, boat fishermen tend to launch earlier in the morning to minimize conflicts with powerboaters. The east ramp parking lot is half full by 7 a.m. on some summer weekends.

FISHING

Between 1984 and 1988, the number of people shoreline fishing or ice fishing at Cherry Creek Lake increased by almost one-fourth, and the number of people fishing from boats almost tripled. More people began to fish at Cherry Creek Lake because of the put-and-take stocking of pan-size rainbow trout by the DOW and DOW publicity regarding the trophy size of other fish species in the lake. They have continued to fish at the lake because of good fishing success. The lake is a trophy walleye fishery. Walleyes, wipers, tiger muskie, and channel catfish are stocked as fry or fingerlings. These species have good natural survival rates partly because of the abundance of gizzard shad. The DOW stocks catchable-size rainbow trout on a put- and-take basis. Self-supporting populations of crappies and various sunfish species add to the sport fishery.

Boat Fishing. Boating facilities for fishermen in the vicinity of the east ramp are discussed in the boating section. Many visitors who fish from boats also picnic with their families at the east side shade shelters. There are only 10 shelters, each containing 2 tables, and they are used by both boat fishermen and shoreline fishermen. All the shade shelters are often occupied by 8 a.m. by fishermen's families. The scarcity of picnic facilities in this area forces many fishermen and their families to eat sitting on the ground.

Additional shaded picnic sites on the opposite side of the east shade shelter access road would help reduce picnicking deficiencies for fishermen and their families in this area. Shoreline erosion has also been a problem, and the rock riprap is in need of repair. Installation of turf grass and an irrigation system at the east side shade shelters would make ground picnicking more enjoyable, increase esthetic resources, and reduce surface erosion.

Shoreline Fishing. Most shoreline fishermen use the dam face; the handicapped fishing pier; and the riprapped lakeshore areas at Tower Loop, at the east side and west side shade shelters, and at the west side fishing loops. The 1986 Colorado SCORP categorizes the need for additional facilities for shore fishing in Region 3 as "medium." Shoreline fishermen constitute approximately 25 percent of the visitors at the Cherry Creek SRA. Many areas which now accommodate shoreline fishing activities are experiencing erosion. Shoreline protection is needed to ensure future opportunities for shoreline fishing at current visitation levels. Facility improvements at several areas are needed to meet the needs of the increasing number of shoreline fishermen.

- East Side - Needed improvements at the east side shade shelters have previously been described. Tower Loop, one of the most popular shoreline fishing areas, needs a flush comfort station and fish-cleaning station to accommodate increased use. Riprap repairs are also needed at Tower Loop, where shoreline erosion has exposed tree roots.

- West Side - To provide better shoreline fishing access and to protect facilities located near the shore from erosion, shoreline erosion protection is needed from the dam face to Mountain Loop, the northernmost of the west side fishing loops. Construction of a flush comfort station and additional picnic shelters in Lake Loop would serve the needs of the increasing number of shoreline fishermen and sailboarders.

Handicapped Fishing Facilities. The existing handicapped-accessible fishing pier is located south of the east side shade shelters, close to the shore. This pier is frequented by the elderly and by children fishing under adult supervision, as well as by the handicapped. It is often crowded, and additional fishing facilities for the handicapped are needed.

- Dixon Grove Jetty - To provide more fishing facilities for the handicapped, the DPOR installed handicapped-accessible fishing pods on the jetty near the Dixon Grove picnic area in 1989.

- Dam Face - The face of the dam is a very popular shoreline fishing spot. The water between the dam and marina ranges from 23 to 40 feet in depth and provides good fishing opportunities even during times of low lake levels. This area would provide good fishing access to deep water for handicapped persons. Handicapped-accessible fishing pods would be desirable at the west end of the dam face. Access to the pods from the marina parking lot can be provided by a paved path located north of the lakeside wetlands.

Ice Fishing. This activity remains popular at Cherry Creek Lake. The most popular spots for ice fishing are near the west side shade shelters, near Tower Loop, and near the Dixon Grove jetty.

The marina food concessionaire may be requested by the DPOR to remain open during the winter to serve ice fishermen and other recreators. All flush comfort stations installed by the DPOR since 1987 have space heating. New flush comfort stations will also have space heating to meet the needs of recreators during the late fall, winter, and early spring.

SWIMMING AND SUNBATHING

The swim beach is the most popular facility at Cherry Creek Lake during the summer. The 1986 Colorado SCORP classifies Region 3 needs

for additional swimming facilities as "medium." Swim beach visitation at Cherry Creek Lake increased by almost one-fourth between 1984 and 1988. Weekday use is heavy. The City of Aurora's sand volleyball league games are played on the swim beach, and the swim beach often reaches capacity even on Wednesdays and Thursdays. The DPOR's 1982 user survey indicated that many campers used the swim beach. In the 1982 user survey, a natural swim beach was rated as the number 1 or 2 amenity at Cherry Creek Lake by participants in all types of activities except hikers and nature students, who rated it as number 3.

It appears that the beach itself may be more important than the adjacent swimming area. Surprisingly, only one-third of the visitors who use the swim beach at Cherry Creek Lake actually go into the water. Most people using the swim beach sunbathe, play sand volleyball, supervise children who are swimming or wading, or picnic. Installation of shade shelters and turf grass and an upgrading of the irrigation system east of the swim beach would provide needed picnic opportunities, would increase the capacity of the beach, and would accommodate sunbathers if high lake levels reduce the size of the beach.

Because of the strong and increasing participation in activities at the swim beach and the limited capacity of the swim beach, the DPOR is contemplating construction of an additional outdoor swimming area with turf grass and sand beach at some future date. No preliminary site has been selected. This swimming area would not be hydrologically connected to the creek or lake and would have its own system for draining, filtering, and chemically treating the water. It would be located in an area appropriate for intensive recreation development.

PICNICKING

The number of visitors whose primary activity is picnicking decreased by almost 30 percent between 1984 and 1988. The total number of picnickers at Cherry Creek Lake has actually increased, however, because many boaters, fishermen, and other recreators often picnic as a

secondary activity and are not included in the DPOR's picnicking activity data. The 1986 Colorado SCORP categorizes the need for additional picnicking facilities in Region 3 as "high." A majority of the SRA visitors surveyed in 1982 by the DPOR desired the development of more picnic sites. Additional picnic tables/shade shelters and support facilities are needed to accommodate increased picnicking demands.

Reservation Picnicking. The 12 Mile House group picnic area, which is available only on a reservation basis, is located south of the perimeter road, east of the Cherry Creek streambed. The area has a normal capacity of 150 persons, but groups average 60 to 75 persons and have ranged up to 600. Reservations are taken beginning in January for the coming year, and by mid-March of every year, the group picnic area has been reserved for every weekend through October. To better meet public group picnicking demands, a second large group picnic shelter/flush comfort station and additional parking stalls are needed in the group picnic area.

In 1989 the DPOR made the Smoky Hill Shelter, located near the large swim beach parking lot, and a small section of the Dixon Grove picnic area available for reservations because of the increased demand for group picnicking. All of these facilities are open to nonreservation picnickers when not reserved. The Smoky Hill Shelter is frequently used by hikers and bicyclists as a rest stop or for picnicking.

Nonreservation Picnicking. Numerous picnic facilities are available on both the east and west sides of Cherry Creek Lake. Picnic facilities were added to several picnic areas in 1989 to meet increased picnicking demands. Additional picnic facilities are also needed. If future visitor demands warrant, additional picnic sites could be developed by scattering picnic tables along the banks of Cherry Creek adjacent to roads or trails.

• Marina - The plaza area adjacent to "The Sails" building was underutilized. To increase the use and picnicking capacity of this area, the DPOR regraded the area in 1989 and installed a plaza with picnic tables and shelters, benches, a drinking fountain, and a new food concession building with an indoor dining area. The existing large parking lot is adequate to accommodate the additional picnickers.

• Hobie Hill Shelter Area - The comfort station/fish-cleaning station on the hilltop north of the west side shade shelters was determined by the DPOR and the Corps to be underutilized. It had no parking lot and was far from picnicking and fishing activities; it was sited in that location because of the existing gravity flow sewer line to the septic system.

To provide picnic facilities which meet existing needs and which will rarely be inundated, the DPOR began to redevelop the hilltop area as the Hobie Hill Shelter area in 1989. The segment of the perimeter road lying north of the west side shade shelters was relocated farther to the west to increase safety and picnicking capacity. Two clusters of picnic shelters which can also serve as group picnic facilities were constructed near the comfort station. By 1992 it will be possible to reserve the Hobie Hill Shelters. Construction of a third picnic shelter cluster and additional parking are planned. Renovation of the comfort station is also planned; a handicapped-accessible toilet facility will replace the rarely used fish-cleaning facilities.

• West Side Shade Shelters - There are only 10 west side shade shelters. Often all of them are occupied, even on weekdays, because they are well oriented to shade picnickers from the afternoon sun and are in areas heavily used for picnicking by shoreline fishermen, sailboaters, and (during the school year) students from Cherry Creek High School. Some foot access trails from the west side shade shelters down the scarp to the shoreline are currently unsafe. Shoreline erosion protection measures which afford good access between the west side shade

shelters and the shoreline are needed. This area lacks trees because of shallow soils. The inclusion of tree species which are relatively well adapted to these conditions in the landscaping plan would appropriately respond to public demand for "more shade trees," which was the third most-cited development preference in the DPOR's 1982 user survey.

To meet the needs of picnickers and fishermen, the DPOR plans to construct a flush comfort station with space heating west of the west side shade shelters. Conversion of the west side shade shelter access boulevard to two cul-de-sacs would increase safety and would not decrease the number of parallel parking stalls. If picnicking demands on the west side of the lake increase beyond the capacity of the existing and planned facilities at the marina, the Hobie Hill Shelter area, and the fishing loops, additional picnic facilities with bicycle trail access may be developed south of the west side shade shelters.

• Dixon Grove - This area, which consists of picnic tables under trees, is heavily used because it is shady and because it is near the swim beach. A flush comfort station is needed because approximately 500 visitors use this area each summer weekend day. The dry climate and soil compaction from foot traffic make it difficult for grass to grow; installation of turf grass and an irrigation system will improve esthetics and decrease the potential for soil erosion. Shoreline protection between the swim beach and Tower Loop is also needed to protect the integrity of the Dixon Grove jetty, to prevent erosion from undermining the bicycle trail between the picnic area and the lake, and to reduce turbidity at the swim beach.

CAMPING

The average length of stay in the Cherry Creek campground is 4 nights. Most of the campers visit friends and relatives and/or sightsee in the Denver area while staying at Cherry Creek Lake. The 1986 Colorado SCORP indicated a "medium" need in Region 3 for additional facilities for car camping. Of the SRA visitors surveyed by the DPOR in

1982, three-fourths felt that a campground was appropriate at Cherry Creek Lake and 70 percent thought that electrical hookups should be provided.

The number of campers at Cherry Creek Lake decreased by approximately one-fourth between 1984 and 1988. There are several reasons for this decrease. First, there has been a sharp decrease in the number of transients, who in past years resided in a series of State Park and SRA campgrounds for the entire recreation season. DPOR enforcement of regulations allowing an individual or group to camp at one or more State Park campgrounds for no more than 14 days in a 45-day period has helped alleviate this problem. Second, as the price of gasoline in real dollars has decreased, more campers who wish to spend time sightseeing in the Denver area are choosing campsites in the mountains rather than campsites in the urban area. Third, campers who leave the Cherry Creek SRA may have to wait in line for up to 3 hours to reenter the park through one of the main entry gates because of carrying capacity controls. Fourth, camping fees have increased. Finally, there are no electrical hookups in the Cherry Creek campground.

Over 20 percent of the camping parties include at least one person who is 62 years of age or older. Preliminary results of a user survey conducted by the DPOR in 1988 indicated that approximately 75 percent of campers, including almost all of the elderly campers, use mobile homes, pickup campers, or camping trailers and at least 60 percent of all campers surveyed indicated a willingness to pay an additional fee for electrical hookups. The installation of electrical hookups to two or three camping loops would respond to these expressed public desires.

The DPOR constructed a flush comfort station with showers and space heating at Camping Loop E in 1987 with cost-sharing funds to meet camper needs during cooler weather at the beginning and end of the camping season. A similar comfort station at another camping loop and at shade shelters throughout the campground are also needed. The DPOR is

considering keeping one camping loop with a heated comfort station open year-round. To enable campers to avoid long park-entrance waiting lines, a new campground entrance road with direct access from Parker Road is needed.

TRAIL USE

Approximately one-fourth of the visitors who participated primarily in hiking, jogging, bicycling, or horseback riding entered the project via trail connectors with the Denver-area bicycle and equestrian trail systems. This trail system entry increased from a negligible amount in 1977 to 50,000 in 1988 because of a number of factors. These include an increasing number of visitors from nearby expanding residential areas, motels, and office parks; increased connections to Denver-area trail systems; the availability of off-project parking near trail entry points; and waiting times of up to 3 hours for vehicular entry to the SRA because of carrying capacity controls. The DPOR's "Cherry Creek SRA General Management Plan" states that the major need for additional recreation opportunities at Cherry Creek SRA is for additional trails.

Bicycle Trails. Bicyclists, hikers, joggers, and mountain bikers use the bicycle trails at Cherry Creek Lake. The DPOR constructed new bicycle trails with connections to the Denver-area bicycle trail system in 1987. Bicycle trails in Village Greens Park and J.F. Kennedy Park connect with the bicycle trails in the SRA, and a connection with the bicycle trail in Olympic Park has been proposed.

• Bicycling - DPOR visitation data show that between 1984 and 1988, the number of bicyclists at Cherry Creek Lake almost doubled. The number of bicyclists has increased for two reasons. First, bicycling opportunities have increased at Cherry Creek Lake. The new bicycle trail connectors have enabled more bicyclists to enter the project from the regional bicycle trail system. Second, many outdoor recreators in the Denver area are increasing participation in activities requiring a higher energy level, such as bicycling, and many Cherry Creek Lake

visitors who formerly hiked and jogged have switched to bicycling. The 1986 Colorado SCORP categorized the need for additional facilities for bicycling in Region 3 as "high." Additional bicycle trails are needed to meet increased bicycling demands. Because the 1982 user survey indicated that over 86 percent of all Cherry Creek SRA users would like to have bicycles available for rent, the DPOR plans to provide for bicycle rentals.

• Mountain Biking - This activity is increasing at Cherry Creek Lake. The 1986 Colorado SCORP indicates that the need for additional facilities for mountain biking in Region 3 is "high." DPOR staff encourages mountain bikers to use the bicycle trail, and a mountain biking trailhead was established at the bicycle trail near the parking lot for the old nature trail. Mountain bikers are also allowed to use the equestrian trails on the west side of Cherry Creek. The equestrian trails are wide enough for use by maintenance vehicles and fire-fighting equipment, and the mountain bikes do not appear to have caused any erosion problems in addition to the erosion caused by horses. The safety of horseback riders does not appear to be a problem because of the width of the equestrian trails and because the equestrian trails on the west side of the creek are not used for horseback riding as frequently as those on the east side. When the stable and additional equestrian trails have been moved to the west side of the creek, the use of equestrian trails by mountain bikes will have to be reevaluated. It is possible that in the future, a separate mountain biking trail will be constructed or designated.

• Hiking and Jogging - Jogging activities at noon and during late afternoon by workers from nearby office parks and after school by athletic teams from nearby schools have increased. The 1986 Colorado SCORP categorizes the need for additional hiking facilities in Region 3 as "high."

Although the DPOR activity data indicate that hiking and jogging activities at Cherry Creek SRA decreased by almost one-fourth between 1984 and 1988, the DPOR indicates that the number of persons hiking or jogging at Cherry Creek Lake in 1988 actually equaled or exceeded the 1984 figure. The DPOR's hiking and jogging activity data are known to be biased in two ways. First, most visitors who park in the lot near the old nature trail, and are thus recorded as using the nature trail, are actually hiking or jogging on the bicycle trail. Second, Cherry Creek Lake visitors are participating in more activities per outing, and an increasing number of visitors who are participating primarily in another activity at Cherry Creek Lake are engaging in hiking or jogging as a secondary activity. These hikers and joggers are not included in the DPOR activity data because only primary activities are recorded.

Nature Trail. A gravel nature trail 0.5-mile long is located adjacent to the delta area on the east side of the lake, and a portion of the trail traverses the delta. The 1986 Colorado SCORP categorizes the need for additional nature study facilities in Region 3 as "high." DPOR data show that use of the nature trail declined by over one-third between 1984 and 1985. Visitation decreased mainly because deficiencies in the culverted segment of the perimeter road near the nature trail caused the perimeter road, the access to the nature trail parking lot, and segments of the nature trail itself to be frequently inundated.

The perimeter road and nature trail parking access were no longer inundated after the DPOR made road repairs in 1986, but the nature trail visitation remained at the same relatively low level. Nature trail use is actually negligible because most visitors recorded as using the nature trail actually park their vehicles in the nature trail parking lot and use the bicycle trail. Nature trail use has remained minimal because increases in the seasonal high water table have inundated many segments of the nature trail and have made hiking through the area difficult. This situation is expected to continue because of the

proposed raise in the multipurpose pool level. A new nature trail at a different site was required.

In 1989, the DPOR constructed a nature trail 0.75-mile long which begins at Prairie Loop and extends along Cottonwood Creek. The new nature trail area contains resources similar in type and interpretive potential to those in the delta area. Other areas at Cherry Creek Lake are also appropriate for the development of nature trails. If the west side shade shelter picnic area expands southward, a boardwalk nature trail in the vicinity of the drainageway will be considered.

Equestrian Trails. The number of horseback riders at Cherry Creek Lake increased 60 percent between 1984 and 1988. Extensive development adjacent to the project accounts for much of this increase because reductions in undeveloped land and increases in road traffic have channeled horseback riders onto the equestrian trails. Increased services offered by the stable concession, such as sleigh rides during the winter, have also increased horseback riding visitation. The 1986 Colorado SCORP categorizes the need for additional horseback riding facilities in Region 3 as "high."

To meet increased equestrian demands, the DPOR has begun construction of additional equestrian trails, some of which will connect to Denver-area regional equestrian trail systems. A noncost-shared equestrian cross-country course with jumps may also be desired by the DPOR. If Jordan Road is closed to through traffic as a result of construction of a new Cherry Creek crossing road, the concessionaire is expected to move the stable from its current location on the east side of the lake to an area between Jordan Road and Cherry Creek. The DPOR will provide public corrals and portable sanitary facilities after the stable building is moved. This new location will be more centralized relative to the future system of equestrian trails.

DOG TRIAL AREA USE

There is no discernible trend in use of the dog trial area. Visitation at the dog trial area increased by one-fourth between 1984 and 1986, but 1988 visitation at this area was approximately 10 percent less than the 1984 visitation. The existing dog trial area has an uncontrolled access from Parker Road. If through traffic is eliminated on Jordan Road as a result of construction of a Cherry Creek crossing road, a new dog trial area location near the south end of the park, with access from Jordan Road, would allow better control and management of dog trial activities. If the dog trial area is relocated, the existing parking lot accessed from Parker Road would be closed to public use.

MODEL AIRCRAFT FLYING

Based on DPOR activity data, visitation at the model airplane field appears to have decreased by more than one half between 1984 and 1988. The DPOR indicates that actually, there were approximately 20,000 visitors using the model airplane field in both 1984 and 1988. The apparent decrease in visitation is the result of a change in the turnover rate for model aircraft flyers used by the DPOR to calculate visitation at the model airplane field. The change in the turnover rate was based on a 1984 visitation survey and car counts, which indicated that model aircraft flyers spent more hours per day at Cherry Creek Lake than did most other day users. The DPOR installed a vault toilet near the model airplane field in 1988. Paving of the access road would reduce the airborne dust particles ingested by the model aircraft engines.

RIFLE RANGE USE

Patronage at the rifle range decreased approximately 10 percent between 1984 and 1988, even though the total number of rifle ranges in the Denver area has been reduced to five, because of the requirement to pay an annual or daily State Park entry fee and because the rifle range was open only Wednesday through Sunday from 9 a.m. to 5 p.m. The rifle range patronage increased in 1989 because the State Parks Board approved

an alternative entry fee for rifle range users, which the DPOR implemented in July 1989, and because the concessionaire increased the number of hours and days the range is open. The concessionaire also plans to add an archery range to meet public demands.

Because the rifle range is buffered by large earthen berms, moving the horse stable concession and the dog trial area to the general vicinity of the rifle range would cause no conflicts in regard to noise or safety.

OPEN SPACE USE

Approximately 60 percent of project fee lands (70 percent of the project acreage above multipurpose pool level) is used for wildlife management and low-density recreation in tandem. Low-density recreation activities include trail use, field hiking, nature study, wildlife observation, photography, and sightseeing. No hunting or trapping activities are permitted at the Cherry Creek Lake project.

These relatively undeveloped lands are managed by the Corps, the DPOR, and the City of Aurora. They constitute a buffer zone between the residential and commercial development which surrounds the Cherry Creek Lake project and other uses of project lands.

The low-density use lands managed by the Corps or leased to the DPOR help maintain the character of the Cherry Creek SRA as a state park and differentiate it from a city park. The DPOR's 1982 user survey showed that users felt preservation of the open character of the SRA was very important. Among the reasons for visiting the SRA which users in the survey characterized as "moderate" or "strong," 73 percent cited "to experience nature" and 86 percent cited "to be in open surroundings." The DPOR's tree-planting program in the open space area of the SRA is responding to the fact that "more shade trees" was the third-most-cited development preference in the DPOR's 1982 user survey. Trees are being planted along drainageways and ponds rather than being scattered over

the open space area to maximize survival rates and to avoid the appearance of a "city park."

The low-density use lands leased to the City of Aurora provide a barrier between the urban uses adjacent to the project and the spillway channel. Maintenance of these lands in open space aids in keeping human disturbance in the spillway channel to a minimum. Minimal levels of disturbance are important for maintaining the wildlife populations and habitat in the spillway area. Aurora has designated the low-density use lands north of the spillway as a "Wildlife Area."

SIGHTSEEING

Most people who visit the Cherry Creek Lake project sightsee as a secondary or tertiary activity; this type of sightseeing is not included in the new activity mix. From 1985 through 1988, approximately 11 percent of the visitors to the Cherry Creek SRA participated in sightseeing as their primary activity. Many of these visitors watched their companions engage in activities but did not participate themselves. Others merely drove through the SRA, often on their way to or from work, as an esthetic alternative to commuting on city streets. Because sightseers, especially the commuters, spend much less time in the SRA per visit than do other visitors, sightseeing is only 4 percent of the activity mix. Sightseeing is facilitated by the roads which traverse the project and the pullover parking areas adjacent to the dam crest road in the vicinity of the intake tower and outlet works. There are no plans to augment sightseeing facilities. If the proposed Cherry Creek crossing road is constructed and Jordan Road, Peoria Street, and Belleview Avenue (and possibly the dam crest road) are closed to through traffic, facilities for sightseeing may actually decrease.

GAME FIELD USE

Softball and baseball fields, soccer/football multipurpose fields, tennis courts, and golf course facilities have been constructed on project lands that are visually and/or functionally separated from

the SRA by the dam embankment, the spillway, or a major roadway. The lands on which these facilities have been developed are leased to the City and County of Denver, the City of Aurora, or the City of Greenwood Village. The Corps has not cost-shared in the development of these "city parks." Most visitors to these parks reside in the municipality which assumed local sponsorship. Approximately one-fourth of the project visitation is accounted for by spectators or players using these playing fields. That visitation percentage will increase in the future as additional municipal playing facilities are developed to meet the needs of the local urban population and as visitation growth at the Cherry Creek SRA is limited by carrying capacity controls.

The 1986 Colorado SCORP categorized the need for additional facilities for playgrounds; football and soccer fields; baseball and softball fields; and golf courses in Region 3 as "high." The increasing populations of Aurora and Greenwood Village have generated a demand for additional playing fields. To meet these needs, Aurora has recently developed some adult soccer fields and proposes to develop youth soccer fields and a second softball complex on project lands as part of a phased plan already approved by the Omaha District. Greenwood Village plans to develop a golf course partially on project lands; the need for the golf course and its economic feasibility are supported by the "Feasibility Report for Village Greens II Park," prepared for the City of Greenwood Village by Greystone Development Consultants, Inc., in August 1987. Denver has expanded its park facilities to meet existing needs caused by the growth in popularity of soccer and softball. To further meet these needs, Denver plans to develop a second softball complex in J.F. Kennedy Park and desires to expand and enhance its soccer facilities at the J.F. Kennedy Park soccer complex if the Corps retains, rather than disposes of, the 39.5-acre parcel on which the soccer complex is located. This 39.5-acre parcel is discussed in the Real Estate section of this chapter. Denver also plans to expand the 18-hole golf course in J.F. Kennedy Park to 27 holes.

APPLICATION OF PERTINENT PUBLIC LAWS

CIVIL AUTHORITY

Except as otherwise provided by Federal law or regulation, State and local laws and ordinances apply on project lands and waters. These include, but are not limited to, State and local laws and ordinances governing the following:

- Operation and use of motor vehicles, vessels, and aircraft;
- Hunting, fishing, and trapping;
- Display or use of firearms or other weapons;
- Camping, starting or tending fires, and use of fireworks;
- Civil disobedience and criminal acts; and
- Littering, sanitation, and pollution.

Enforcement of State and local laws is by State and local law enforcement agencies established and authorized for that purpose. Law enforcement, fire protection, and rescue services for the areas of the project leased to the City of Aurora and the City and County of Denver are provided by those jurisdictions. For the area leased to the City of Greenwood Village, the Greenwood Village Police Department provides law enforcement and the Castlewood Fire District provides fire protection and rescue services. DPOR and DOW regulations are enforced on Cherry Creek SRA lands and waters by State personnel; violators are subject to the penalties set forth in Title 33, Colorado Revised Statutes 1973, as amended. The DPOR has cojurisdiction with the Arapahoe County Sheriff's Office for enforcement of local ordinances; usually the county handles felonies and the DPOR handles misdemeanors. For fire protection and

rescue services, the DPOR contracts with Aurora for the east side of the SRA and with the Castlewood Fire District for the west side of the SRA. An Emergency Medical Technician Center is provided at no charge by Presbyterian Hospital. For areas of the project which are not leased out, the Arapahoe County Sheriff's Office provides law enforcement and calls for rescue and ambulance services when needed. Aurora and the Castlewood Fire District provide fire protection.

CORPS AUTHORITY

Rules and regulations governing public use of water resources development projects administered by the Corps are contained in Section 327 of Title 36, Code of Federal Regulations (CFR). Persons designated by the District Engineer have the authority to issue citations for violations of rules and regulations governing public use of Corps water resources projects. If a citation is issued, the person charged with the violation may be required to appear before a U.S. Magistrate.

FEDERAL AUTHORITY

The following Federal Public Laws and Executive Orders pertain to authorization of the project, present and future development, and operation of project lands and waters.

General Laws and Authorities.

• 18 August 1941, Public Law 228, 77th Congress (55 Stat. 638 and 646, U.S.C. 701c: The Flood Control Act of 1941 authorized construction of the Cherry Creek and Castlewood Dams and appropriated $3 million for initiation and partial accomplishment of the projects.

• 22 December 1944, Public Law 534, 78th Congress, as amended (58 Stat. 887 and 897, 16 U.S.C. 460d): Commonly known as "The Flood Control Act of 1944," this law authorized the construction of certain public works on rivers and harbors for flood control and other purposes. Included among the authorizations was additional funding of $7.5 million

to complete the Cherry Creek and Castlewood projects. Section 4 authorized providing facilities in reservoir areas for public use, including recreation and conservation of fish and wildlife. As amended in 1962 by Section 207 of Public Law 87-874, the act authorized the Corps to develop and maintain park and recreation facilities at all water resources projects controlled by the Secretary of the Army.

• 4 August 1954, Public Law 566, 83rd Congress (68 Stat. 666, 16 U.S.C. 1101, et seq.): The Watershed Protection and Flood Prevention Act authorizes Federal cooperation with State and local agencies in promoting soil conservation. The Secretary of Agriculture is authorized to evaluate plans for watershed improvements submitted by State and local agencies and to render financial and other assistance. This authorization covers flood prevention and agricultural phases of the conservation, development, utilization, and disposal of water in watershed areas not exceeding 250,000 acres. A number of structures were constructed in the Cherry Creek watershed under the provisions of this act.

• 3 September 1964, Public Law 88-578, as amended (78 Stat. 897, 16 U.S.C. 460d and 4601-4, et seq.): The Land and Water Conservation Fund Act of 1965 established a fund from which Congress can make appropriations for outdoor recreation. The fund derives revenue from entrance and user fees, the sale of surplus Federal property, and the Federal motorboat fuel tax. This act provided funding for many of the recreation facilities constructed by the State of Colorado at the Cherry Creek SRA in the 1970's.

• 9 July 1965, Public Law 89-72, as amended (79 Stat. 213, 16 U.S.C. 4601-5, 4601-12, et seq.): The Federal Water Project Recreation Act provides for the formulation of uniform policies with respect to recreation, fish and wildlife benefits, and costs of Federal multi-purpose water resource projects. The Chief of Engineers implementation

of this law authorized cost-shared development of public use facilities at Corps reservoir projects in cooperation with non-Federal sponsors. It was under the provisions of this act that an LCA with the Colorado DPOR for cost-shared recreation development at Cherry Creek Lake was executed in June 1974.

• 17 November 1986, Public Law 99-662 (100 Stat. 4082, 33 U.S.C. 2201): Section 1002 of the Water Resources Development Act of 1986 deauthorized the Castlewood Lake project.

Environmental Quality Statutes.

• 6 September 1960, Public Law 86-717 (74 Stat. 817, 16 U.S.C. 580m and n): The Forest Conservation Act provides that Corps of Engineers' reservoirs shall be developed and maintained to ensure adequate future resources of timber for conservation, recreation, and other beneficial uses. The law also provides for coordination between agencies. This law allows the Cherry Creek Lake project to be revegetated.

• 23 August 1968, Public Law 90-495, (82 Stat. 815, 23 U.S.C. 101, et seq.): The Federal-Aid Highway Act of 1968 amends Section 4(f) of the 1966 Department of Transportation Act (Public Law 89-670) and Section 138 of the 1966 Federal-Aid Highway Act (Public Law 89-574) to provide that the Secretary of Transportation shall cooperate and consult with other Federal agencies and with the States to ensure that no publicly owned park and recreation lands, wildlife refuges, or significant historic sites (all referred to as Section 4(f) lands) will be utilized for transportation programs or projects unless: there is no feasible and prudent alternative to the use of Section 4(f) land; such transportation program includes all possible planning to minimize harm to Section 4(f) land; and the official having jurisdiction over the Section 4(f) land agrees in writing with the assessment of the impacts of the proposed project on, and the proposed mitigation for these impacts on, the Section 4(f) land. The provisions of this act have been

complied with prior to the use of several parcels of Cherry Creek Lake project land for road construction by the Colorado Highway Department.

• 1 January 1970, Public Law 91-190, as amended (83 Stat. 852 et seq., 42 U.S.C. 4321, et seq.): The National Environmental Policy Act (NEPA) of 1969, as amended, declares a national environmental policy. Section 102 requires that all Federal agencies shall, to the fullest extent possible, use a systematic, interdisciplinary approach which integrates natural and social sciences and environmental design arts in planning and decision making; study, develop, and describe appropriate alternatives to recommend courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources; use ecological information in the planning and development of projects; and include an environmental impact statement (EIS) in every recommendation or report on proposals for major Federal actions significantly affecting the quality of the human environment.

An environmental assessment (EA) evaluating impacts of actions recommended in this Master Plan was prepared. It determined that a finding of no significant impact (FONSI) was appropriate. A FONSI was signed 28 April 1991.

• 19 December 1973, Executive Order 11752: This order is entitled "Prevention, Control, and Abatement of Environmental Pollution at Federal Facilities." Its purpose is to assure that the Federal Government, in the design, construction, management, and operation and maintenance of its facilities, provides leadership in the nationwide effort to protect and enhance the quality of our air, water, and land resources through compliance with applicable standards.

• 28 December 1973, Public Law 93-205, as amended (87 Stat. 884, 16 U.S.C. 1531, et seq.: The Conservation, Protection, and Propagation of Endangered Species Act, also known as the "Endangered Species Act of 1973," requires that Federal agencies shall, in consultation with the

U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service, utilize their authorities in furtherance of conserving endangered and threatened species and take such action as necessary to assure that their actions are not likely to jeopardize such species or destroy or modify their critical habitat. The act sets up a procedure of coordination, assessment, and consultation. The Amendments of 1978 (Public Law 95-632) direct agencies to conduct a biological assessment (BA) to identify endangered or threatened species which may be present. The Endangered Species Act of 1979 (Public Law 96-159) expands the 1973 Act to protect endangered plants.

In September 1989, the Omaha District requested that the FWS provide a list of federally listed threatened or endangered species in the project area. The FWS indicated to the Omaha District that three species--the bald eagle, peregrine falcon, and black-footed ferret--may occur in the project area. The Omaha District conducted a BA of these species, in the context of the EA to evaluate impacts of proposed development on endangered species. The conclusion was made that no effect would occur to these species. However, any action that could affect prairie dog towns substantially may need to be preceded by a ferret survey.

In matters beyond the Master Plan purview, the Corps has other Endangered Species Act obligations. The Corps will prepare a BA for the storage and release operations of Cherry Creek, Chatfield, and Bear Creek Reservoirs.

• 16 December 1974, Public Law 93-523 (88 Stat. 1660, 42 U.S.C. 300, et seq.): The Safe Drinking Water Act states that all public water systems, whether owned or maintained by the Federal Government or by non-Federal entities, will meet or exceed the minimum standards required by law.

All drinking water at the Cherry Creek Lake project is supplied by municipal water systems. These municipalities are in compliance with this law.

• 24 May 1977, Executive Order 11988: This order, Flood Plain Management, outlines the responsibilities of Federal agencies in the role of flood plain management. Each agency shall evaluate the potential effects of actions on flood plains and should not undertake actions which directly or indirectly induce growth in the flood plain, unless there is no practical alternative.

The project is in compliance with this order. Only land uses and facilities compatible with a flood plain location are allowed within the 100-year flood pool.

• 24 May 1977, Executive Order 11990: This order, Protection of Wetlands, directs Federal agencies to provide leadership in minimizing the destruction, loss, or degradation of wetlands. Section 2 states that agencies shall avoid undertaking or assisting in new construction located in wetlands unless there is no practical alternative. If it becomes necessary to place any fill in wetlands at the project, new wetland areas will be created which are equivalent to those lost.

• 27 December 1977, Public Law 95-217 (91 Stat. 1566, 33 U.S.C. 1251, et seq.): The objective of the Clean Water Act of 1977 is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Section 404 authorizes a permit program for the disposal of dredged or fill material in the Nation's waters that is to be administered by the Secretary of the Army, acting through the Chief of Engineers.

If any construction activities involve the placement of dredged or fill material into any water body or wetland area on the Cherry Creek Lake project, compliance with Section 404 will be required.

Authorization may require evaluation for an individual permit, or existing nationwide permits may cover the activity. In order for the Corps to determine which type of authorization is appropriate, proposed project plans must be sent to the Regulatory Branch, Operations Division of the Omaha District. Water quality certification from the Colorado Department of Health is required for all proposed projects prior to Section 404 permit issuance.

• 13 October 1978, Executive Order 12088: Solid waste disposal and the control of air and water pollution will be in accordance with this Executive order on prevention, control, and abatement of air and water pollution at Federal facilities.

• 29 September 1980, Public Law 96-366 (94 Stat. 1322, 16 U.S.C. 2901, et seq.): The Fish and Wildlife Conservation Act of 1980 provides funds to States to conduct inventories and conservation plans for conservation of nongame wildlife. It also encourages Federal departments and agencies to use their statutory and administrative authority to conserve and promote conservation in accordance with this act.

Historic Properties Statutes.

• 27 June 1960, Public Law 86-523, as amended (74 Stat. 220, 16 U.S.C. 469, et seq.): The Archeological and Historic Preservation Act, also known as the "Reservoir Salvage Act," provides for the preservation of historical and archeological data which might otherwise be lost or destroyed as the result of flooding or any alteration of the terrain caused as a result of any Federal reservoir construction projects; for coordination with the Secretary of the Interior whenever activities may cause loss of scientific, prehistoric, historic, or archeological data; and for expenditure of funds for recovery, protection, and data preservation.

A cultural resource reconnaissance study of the Cherry Creek Lake project area has been completed. All land-altering activities are reviewed by the Omaha District to ensure that no site is adversely affected.

• 15 October 1966, Public Law 89-665, as amended (80 Stat. 915, 16 U.S.C. 470, et seq.): The National Historic Preservation Act states a policy of preserving, restoring, and maintaining cultural resources and requires that Federal agencies take into account the effect of any undertaking on any site on or eligible for the NRHP; afford the Advisory Council on Historic Preservation opportunity to comment on such undertaking; nominate eligible properties to the NRHP; exercise caution in disposal and care of Federal property which might qualify for the NRHP; and provide for the maintenance of federally owned sites on the NRHP.

A cultural resource reconnaissance was completed in the project area, and no sites eligible for nomination to the NRHP were reported.

• 31 October 1979, Public Law 96-95 (93 Stat. 721, 16 U.S.C. 470aa, et seq.): The Archeological Resources Protection Act of 1979 protects archeological resources and sites which are on public lands and Indian land, and fosters increased cooperation and exchange of information between governmental authorities, the professional community, and private individuals. It establishes requirements for issuance of permits by Federal land managers to excavate or remove any archeological resource located on public or Indian lands.

In accordance with this act, the Omaha District staff is involved in a program to lessen impacts by site collecting and vandalism and processes permits for non-Federal entities to perform archeological research.

REAL ESTATE

ACQUISITION

The Cherry Creek Lake project contains 5,344.65 acres of fee ownership and 131.35 acres of permanent flowage easement. The DPR directed fee simple acquisition of lands lying below elevation 5623 feet m.s.l. and acquisition of a flowage easement interest in lands lying between elevations 5623 and 5639 feet m.s.l. Flowage easements were acquired up to elevation 5636 feet m.s.l., the approximate elevation of the maximum pool based on original design criteria. Acquisition of a permanent flowage easement constitutes a perpetual right to flood, to a designated level, land owned by another. The right to flood land includes the right to raise or lower the water level of Corps reservoirs. The landowner retains the right to use the property for purposes that do not interfere with project operations.

Five flowage easements totaling approximately 98 acres were acquired through condemnation proceedings during the initial acquisition stage of the Cherry Creek project. In 1956, three parcels of fee lands totaling 181 acres were reported excess to project needs and were disposed of by the General Services Administration (GSA). The quitclaim deed which disposed of one of these parcels reserved to the Federal Government 33 acres of flowage easement in the extreme upper reaches of the project, increasing the total acreage of easement lands from 98 to 131.35.

OUTGRANTS

Outgrants at Cherry Creek Lake include leases, easements, licenses, and permits. They are defined and discussed below.

Leases. A lease is a contract between the owner (lessor or landlord) and the tenant (lessee), setting forth conditions upon which the tenant may occupy and use the property, and the term of occupancy.

There are six leases at the Cherry Creek Lake project. Easements, licenses, and permits can be issued on land which is already under lease. Lessees can also enter into third-party agreements with the approval of the Corps; the most common of these is with concessionaires. Information regarding these leases is presented in table 2-14.

Table 2-14
Leases Outgranted at Cherry Creek Lake, Colorado

Lessee	Purpose	Acres	Expires
City of Aurora	Public Park & Rec.	330.0	9-04-04
Colo. State Hwy. Dept.	Maint. Patrol Sta.	4.6	10-31-95
Colo. DPOR	Public Park & Rec.	4,185.9	12-31-11
City and County of Denver	Public Park & Rec.	39.5	8-13-91 1/
City and County of Denver	Public Park & Rec.	121.2	8-13-11
City of Greenwood Village	Public Park & Rec.	59.0	8-31-07

1/ This 1-year lease will continue to be renewed on an annual basis pending determination on the eventual disposition of this tract as explained in the following subsection, "Excessing and Disposal Actions."

Easements. An easement is a right-of-use which one party may have on the lands of another party. Rights-of-way for roads, pipelines, and buried cables are the most frequent easement requests across public lands. There are currently 61 easements at the Cherry Creek Lake project, of which 18 are for road rights-of-way (ROW's), 37 are for utility lines (sewer, water, gas, electricity, and telephone), 4 are for drainage, 1 is for a traffic signal, and 1 is for a Regional Transportation District (RTD) Park-and-Ride lot.

Licenses. A license grants authority to enter or use another's land or property, without possessing estate in it. It is revocable. Action without a license constitutes trespassing. Two licenses have been issued at the Cherry Creek Lake project. Both are "consent to easement

structures" across Corps-acquired flowage easement lands. One authorizes a pump station and sewer line and the other a sewer lift station and sewer line.

Permits. A permit is a revocable privilege granted to another Federal agency to use real property for a specific purpose without conferring possessory interest. Two permits have been issued at the Cherry Creek Lake project, an 8-acre permit to the Department of the Air Force for a communication tower and a 90.8-acre permit to the Department of the Navy for research and development conducted by the University of Denver. The Department of the Navy does not intend to renew its permit; although the permit has an expiration date of 30 June 1991, the DPOR will not assume management of this tract, which is included in its lease, until the Navy has fulfilled restoration responsibilities in accordance with its permit.

EXCESSING AND DISPOSAL ACTIONS

Executive Order 12512, dated 25 April 1985, and the Federal Property Management Regulations as contained in 41 CFR 101-47 require periodic review of project land holdings to determine if Federal lands are overutilized, underutilized, or not being put to optimum use. To meet this requirement, the Omaha District conducts annual utilization inspections of the Cherry Creek Lake project; every fifth year, a more detailed Executive order survey is conducted instead of the annual utilization report. The Omaha District is currently preparing an Executive Order 12512 survey.

The previous land use survey was conducted in February 1984 in accordance with Executive Order 12348, which was eventually superseded by Executive Order 12512. The 1984 land use survey identified two parcels of land east of Parker Road as underutilized and excess to project needs. The parcel located north of the spillway contained 1.9 acres, and the one located south of the spillway contained 8 acres. GSA accepted these two parcels and also identified, as underutilized and

excess to project needs, 39.5 acres leased to the City and County of Denver for public park and recreation purposes. Denver had staked the area for soccer fields in 1983 but had not yet begun construction at the time of the land use survey. When Denver's lease expired in August 1986, Denver was issued a 1-year lease for the 39.5-acre parcel and a 25-year lease for the remainder of its previously leased lands. The 39.5 acres continues to be leased on a year-to-year basis pending a determination on the eventual disposition of this property.

In November 1986, GSA deferred action on disposal of the 8-acre and 39.5-acre parcels and returned them to the Omaha District for management pending completion of the Hydrologic Improvement Assessment. A final determination regarding availability of the 39.5-acre parcel for disposal will be made after completion of the Feasibility Study: Hydrologic Improvement Assessment and a reevaluation of project land requirements based on any corrective actions proposed. The feasibility study would be initiated after completion of the reconnaissance report of the ongoing Hydrologic Improvement Assessment.

FLOWAGE EASEMENTS

The flowage easements acquired at the Cherry Creek Lake project give the Government a perpetual right to overflow the land when necessary as a result of the construction, maintenance, and operation of the project. The Government also has the right to enter the easement lands as needed and to remove from the easement lands any natural or manmade obstructions or structures which, in the opinion of the Government, may be detrimental to the operation and maintenance of the project. The flowage easements were acquired subject to "existing easements for public roads and highways, public utilities, railroads, and pipe lines."

Historically, it has been Corps policy to prohibit structures for human habitation on flowage easements acquired by the Corps of Engineers. Construction and/or maintenance of nonhabitable structures on the flowage easement are subject to prohibition or regulation by the

District Engineer. Placement of structures, excavations, and landfill may not result in raising the elevation of any lands included in the flowage easement so that they are above the flowage easement contour, in effect removing part or all of the landfilled area from the flowage easement.

MRD issued a policy statement entitled "Standard Flowage Easement Estate" on 23 December 1980. In addition to citing the general policies stated in the previous paragraph, the policy statement makes the following clarifications: (1) The District Engineer should not grant written permission for a landowner to place nonhabitable structures within the easement area or to perform certain excavations and landfill unless it is determined that the proposed structure and/or activity will not interfere with or adversely impact on project operations. (2) An important impact to be considered is whether and to what extent the storage capacity of the reservoir would be diminished by the structure, excavation, and/or landfill. (3) Another impact to be considered is the precedent which would be established by this granting of permission. (4) In any case involving fill that could raise the elevation above the controlling flowage easement for the project, disposal of the affected portion of the flowage easement must also be considered.

The Omaha District has received several requests to modify or backfill flowage easements at the Cherry Creek Lake project. Occasionally, these requests propose the filling in of one portion of the flowage easement by the material excavated from another portion of the same easement. The Omaha District has established a policy of denial of such requests because the Cherry Creek Lake project does not contain enough fee and easement lands to meet current flood control storage needs. According to the Reconnaissance Report: Hydrologic Improvement Assessment, new hydrological and meteorological models predict that the PMF event would result in Cherry Creek Lake rising to such a high elevation that the lake would extend beyond the boundaries of existing flowage easements upstream from the dam. Although the

acquisition contour for most flowage easements was 5636 feet m.s.l., 8.5 feet below the top of the dam, the PMF event could exceed the crest of the dam. In this extremely rare event, many structures erected outside the project fee lands and flowage easements would be inundated.

Because of the projected increase in extent and frequency of flooding in the Government's flowage easements, it is not in the Federal interest to permit development on, or to encourage development adjacent to, its flowage easements. The Omaha District, therefore, will not allow modification of existing ground contours within flowage easements which results in either the surrender of a portion of the flowage easement or encouragement of additional development adjacent to the boundaries of the flowage easement.

For similar reasons, it is not in the Federal interest to permit landowners to place or construct nonhabitable building structures on existing flowage easements at Cherry Creek Lake. Development nearly surrounds the project, and subdivision of land in which the Government holds a flowage easement appears to be imminent. The cumulative effects of allowing nonhabitable structures on flowage easements could adversely impact project operations for two reasons: reduced floodwater storage capacity; and creation of floatable debris which could damage project structures even in a rainfall event less than the PMF.

For public safety reasons, it is Government policy not to allow landowners to construct roads on flowage easements, even if the road crest is not elevated above the original ground contours, if such roads provide the only vehicular access to a residence or business. Inundation of the road could prevent safe evacuation of people and prevent access by ambulance and firefighting equipment.

BOUNDARY MONUMENTATION AND ENCROACHMENTS

The entire Cherry Creek Lake project was surveyed and monumented in the early 1950's. Original monuments were lost with the flooding of the

reservoir. Developers of land adjacent to the project often used the Corps-established monuments. A Corps boundary resurvey in 1977 found inconsistencies in the previous survey and instances where personal property encroached on land now identified as part of the Cherry Creek Lake project. These encroachments consisted of backfilling, backsloping, landscaping, and removal of Government fencing along the back lot lines of 16 homes on East Cimmaron Drive in The Hills of Cherry Creek subdivision, which is adjacent to the southwest portion of the project. These encroachments do not appear to exceed 4.7 feet and do not significantly impact resource use. The Omaha District is considering the feasibility of boundary line agreements as a solution to this problem.

ANNEXATIONS

Annexation is the act of adding additional land areas to a political subdivision of a State. Several areas of the Cherry Creek Lake project have been annexed by the lessees. Annexation facilitates administration of the area and makes municipal police and fire protection possible. The City of Aurora has annexed the spillway area east of Parker Road; the City and County of Denver has annexed the lands on which the J.F. Kennedy soccer complex, golf course, and ballfield complex are located; and the City of Greenwood Village has annexed project lands on which Village Greens Park is located.

It is Army policy not to oppose annexation and to cooperate with a municipality desiring to annex in accordance with state laws, except where the Secretary of the Army determines that the annexation would not be in the best interest of the Government or if the annexation is opposed by another political subdivision of the State. Two adjacent municipalities attempted or considered annexation of project lands which are still unincorporated parts of Arapahoe County, and a third adjacent political jurisdiction objected to these annexations. Based on Army policy, the Corps will not approve any annexation proposals unless all jurisdictions involved come to an amicable agreement.

SPECIAL CONSIDERATIONS

Arapahoe County has proposed a Cherry Creek crossing road near the southern boundary of the project which would require an easement for a road ROW. Arapahoe County proposes to acquire an easement for the crossing road from the Corps and to, in turn, relinquish existing county-held easements. The acreage of the relinquished easements is expected to exceed the projected acreage required for the new easement. These easements are shown on figure 2-1.

Project lands were generally acquired subject to existing easements for public roads and highways. County roads in existence at the time of acquisition would remain unless the county vacated or abandoned them or unless the road areas were physically vacated because of reservoir ponding. In 1949-1950, the Omaha District considered extinguishing Arapahoe County's easements for roads no longer in use through condemnation. Condemnation proceedings were not initiated because of Arapahoe County's apparent willingness at the time to initiate proceedings to officially vacate these roads. Arapahoe County never did vacate these roads.

The Omaha District will consider a request from Arapahoe County for an easement for a crossing road after the county officially commits to vacating the following segments of road ROW's: Jordan Road between East Belleview Avenue and the dam crest road; Quincy Avenue between the dam crest road and Parker Road; Hampden Avenue between Parker Road and I-225; East Orchard Road between Jordan Road and South Peoria Street; and Prentice Avenue (Melvin Road) between Parker Road and Jordan Road. The county has proposed that if a crossing road is constructed, the following additional road easements would be vacated: Jordan Road between the south project boundary and Belleview Avenue; Belleview Avenue between Jordan Road and Cherry Creek Drive; and Peoria Street between a point north of Orchard Road and Belleview Avenue. The Omaha District would require that these roads be vacated prior to the opening of the crossing road to traffic. If the roads are redesignated

as park circulation roads, the DPOR would assume maintenance responsibilities without receiving a road easement.

If a new crossing road is constructed, some relatively small areas along the southern boundary of the project would be separated from the rest of the Cherry Creek SRA. These isolated parcels of land will be utilized in a manner consistent with project purposes. Because these parcels are currently within the DPOR's leasehold, any use of them would have to be coordinated with the State of Colorado.

RELATED MANAGEMENT PLANS

The following documents have been used for management of the Cherry Creek Lake project's resources.

- Operational Management Plan, Cherry Creek Lake, Colorado, DM CC-9, June 1983, approved December 1983.

The OMP is a management action document that describes in detail how resource objectives and concepts prescribed in the Master Plan will be implemented and achieved. It replaced then-existing Master Plan appendixes. The revised OMP is scheduled to be completed in December 1991 and will be consistent with this Master Plan.

- Annual Management Programs.

The OMP is updated annually by Annual Management Programs. The Annual Management Programs are submitted yearly for approval to the Omaha District from the project and from each lessee. Annual Management Programs include plans; programs; development; staffing; and estimated expenditures for, and projected revenue from, the federally owned areas managed by each jurisdiction.

- Cherry Creek State Recreation Area General Management Plan.

This document provides the policy guidance for DPOR staff in regard to planning and managing the Cherry Creek SRA. It was adopted in November 1985 by the Colorado Board of Parks and Outdoor Recreation.

CHAPTER III

SPECIAL PROBLEMS

A special problem is one which can not be managed or solved at the project level and is deserving of special attention. Problems which are so pervasive as to be insolvable (e.g., climate, soils) and which must be accommodated by prudent development and management are considered influencing factors rather than special problems.

LAND USE AND DEVELOPMENT

RECREATION VALUES

When Cherry Creek Dam was first completed, it was not anticipated that recreation would be an important purpose. A NPS study of recreation potential of the Cherry Creek project at that time indicated that people in Denver would prefer to travel to Rocky Mountain National Park rather than go to Cherry Creek. In a few years, this was shown not to be the case. Urban development in the Cherry Creek basin expanded, and an increasing number of Denver-area residents who wished to spend just a short time in outdoor recreation activities were attracted by the large expanse of natural communities located conveniently located close to home.

Outdoor recreation facilities have been constructed at Cherry Creek Lake to take advantage of opportunities presented by land and water resources. Intensive recreation development has been sited along the east and west shores of the lake. Facilities such as trails have been constructed to support low-density recreation in the large open space areas in a manner compatible with preservation of the existing wildlife habitat. The presence of large amounts of land reserved for open space

uses makes all resource-based activities more enjoyable and is an important part of the public's perception of the Cherry Creek Lake project.

Portions of the Cherry Creek Lake project which are not an integral part of the reservoir area have been made available to local jurisdictions to enable them to better meet the growing needs of their citizens for municipal park facilities. Most of these intensive urban outdoor recreation facilities and activities are sited downstream from the dam and at the downstream end of the spillway. They coexist with the resource-based recreation facilities and activities upstream from the dam.

WILDLIFE VALUES

Urban development in eastern Colorado has put great stress on the prairie ecological system. As grasslands disappear in the wake of urban development in the Denver area, the open grasslands at Cherry Creek Lake play a vital role in providing habitat for many birds and animals. The marshes and mud flats at Cherry Creek Lake are important to waterfowl and shorebirds that utilize this area during migration. Riparian woodlands also provide shade, food, and cover for many species.

These wildlife habitat areas at Cherry Creek Lake need to be protected. Low-density recreation activities in these areas are compatible with preservation of the existing wildlife values. Efforts will be made to concentrate resource-based intensive recreation development in areas where intensive recreation facilities already exist so that there is little disturbance or deterioration of the grasslands, wetlands, and woodlands found in the large open space areas. Tree plantings will be accomplished in a manner which preserves the grassland and marsh areas.

DEVELOPMENT POLICIES

Cherry Creek Lake provides a unique opportunity for the people of the eastern Denver metropolitan area to enjoy the outdoors and wildlife in a setting close to home. This unique opportunity should be preserved. Development policies at Cherry Creek Lake emphasize keeping the open space/low-density recreation areas intact. Every effort will be made to prevent open space lands from being divided by easements. Development in the open space area will be compatible with low-density outdoor recreation activities.

Although Cherry Creek Lake is in an urban environment, it should not be treated as an urban park. High-density recreation facilities characteristic to urban parks (such as basketball courts and baseball fields) are appropriate at Cherry Creek Lake only in those portions of the project which are separated from the reservoir by the dam embankment, the spillway, or a major roadway and are under lease to a local jurisdiction rather than to the State of Colorado.

Other intensive recreation development that is oriented to the land and water resources of the project (such as marinas, beach development, fishing access areas, and picnic shelter areas) may be located on existing designated portions of the project within the State's lease. These designated resource-based intensive recreation areas are sited so that they do not adversely impact low-density recreation use or wildlife use of the open space areas. The east and west shores of the lake and the group picnic area have been so designated.

Development which facilitates public enjoyment of open space (such as trail facilities) or development which requires large open space buffers (such as model aircraft flying fields, outdoor shooting ranges, and dog trial areas) may be sited in low-density recreation areas at Cherry Creek Lake. Such development should be limited so that the

cumulative impacts of incremental development do not significantly reduce either the amount or the open character of low-density recreation areas.

POTENTIAL ON-PROJECT IMPACTS OF A CHERRY CREEK CROSSING ROAD

Arapahoe County desires to construct a four-lane roadway across the southern edge of the Cherry Creek project lands. It would run near the southern boundary of the project, between Parker Road and Peoria Street. The most likely potential alignment of such a crossing road according to Arapahoe County is shown on figure 2-1.

This crossing road concept was the subject of the 1986 "Cherry Creek Crossing Feasibility Study" commissioned by the county. The alternative recommended by that study included a road across the southern edge of the project and spurs connecting to Orchard Road and/or Belleview Avenue. The county later altered the alignment, eliminating the spur connection(s) and leaving only the current concept of a road across the southern edge of the project. As a part of this concept, several rights-of-way currently held by the county inside the project would be relinquished. To date, no official proposal has been made to the Corps for any change in the existing roads. The real estate transactions that would be involved are described in chapter II of this Master Plan.

Some of the most significant impacts and issues that could arise from such a proposal include drainage of runoff from the road into project waters; adequate sizing and design of overpasses for Cherry Creek and Cottonwood Creek and tributary drainageways for preservation of riparian wildlife habitat; and traffic levels with their associated issues of pollution, noise, and conflict with users.

The road runoff would likely carry hydrocarbons, road salt, and other pollutants. Road runoff drainage to Cherry Creek Lake would degrade reservoir water quality, thus thwarting Clean Lakes efforts. Road design should maximize the retention of runoff within the road ROW and minimize any chance of runoff reaching the Cherry Creek or Cottonwood Creek drainageways. Road borrow pits should be designed to retain all runoff, if feasible.

Road crossings over the Cherry Creek and Cottonwood Creek channels could restrict the movement of wildlife along the channels. Deer, smaller mammals, and birds use these channels as habitat and for moving within the project and between the project and neighboring areas. The nearby housing developments have already reduced the potential for movement of mammals into and out of the project, but the corridors that remain should be preserved to the extent feasible. Also, the channel crossings should not reduce the amount and integrity of riparian habitat along these channels or the free flow of water in the channels. The road crossings of streams and drainageways should adequately span them to minimize adverse impacts.

The issue of air pollution is not likely to be significant. The new road would carry a large number of vehicles, but the existing roads adjacent to the project already carry enormous numbers of cars without bothering project users. Without the new route, the internal project roads would still carry heavier levels of traffic in the future. One of these on-project roads, Jordan Road, is currently a dirt road, and traffic causes considerable dust drifting. Also, the new road would be 1 to 2 miles from the nearest intensive recreation areas.

Noise impacts can be projected in similar terms as pollution. Traffic would not be much greater on the new route than on the existing project roads which the new route would replace for through-traffic purposes. The new route would, in fact, move traffic noise up to 2 miles farther away from the main intensive recreation areas than the current roads.

The potential crossing road could have some beneficial impacts on the project. Conflict with recreators would possibly be reduced with the new road. If the county relinquishes ROW's for several roads on project lands, traffic within the interior of the project would be reduced. Through traffic would be confined to the new route on the southern edge of the project. If any of these internal roads were

closed to through traffic, they would no longer serve as such strong dividers of project lands on either side of the roads. Both recreationists and wildlife might move more freely across project lands. Also, the amount of disturbance in that part of the project might decline, making it more attractive to people and wildlife.

Any proposals by the county or another entity to implement these or similar proposals, or any active design efforts for such proposals, should be coordinated promptly with the Corps. An EA and a Master Plan supplement concerning the proposed facilities must be prepared before real estate actions can be completed.

CHAPTER IV

PUBLIC INVOLVEMENT AND COORDINATION

Much of the development proposed in this Master Plan is included in the "Cherry Creek State Recreation Area General Management Plan," which the Colorado DPOR began preparing in 1982. Input from a number of governmental jurisdictions and agencies was solicited during the scoping of the management plan and preparation of the draft narrative. The draft was circulated for comment in May 1985. DPOR staff met with each agency and with various organizations, including homeowners associations, to discuss the draft management plan. A public meeting was held at Cherry Creek High School in Greenwood Village, Colorado, on 5 September 1985. Written comments were accepted through 13 September 1985. Based on this public input, the Colorado DPOR modified the draft management plan. The final draft was made available for review at two local libraries between 1 October and 1 November 1985.

Public meetings were held by the City of Greenwood Village to solicit input on the potential development at Village Greens II. One meeting was held 2 June 1987 at Cherry Creek High School and another was held 14 July 1987 as part of the Parks, Trails, and Recreation Commission meeting.

During the preparation of the updated Master Plan, Omaha District staff coordinated extensively with and met with project lessees--the Colorado DPOR, the City and County of Denver, the City of Aurora, and the City of Greenwood Village. The Omaha District also coordinated with the following entities regarding input to the updated Master Plan:

Arapahoe County; Colorado Department of Health; Colorado Division of Wildlife; Colorado State Historic Preservation Office; Cherry Creek Basin Water Quality Authority (CCBWQA); Denver Regional Council of Governments; Urban Drainage and Flood Control District; U.S. Environmental Protection Agency; and U.S. Fish and Wildlife Service.

In May 1990, the final draft of the updated Master Plan was circulated to Federal, State, and local jurisdictions and agencies for review. Announcements were sent to the news media and local interest groups, including 18 homeowners associations, stating that comments from the general public were welcome. The announcements also stated that copies of the final draft could be inspected at nine local libraries through 15 June 1990 and that additional review copies could be obtained from the Tri-Lakes Project Office or the Omaha District Office. All comments received were appropriately addressed in this updated Master Plan. All entries listed in table 4-1 were furnished copies of the final draft and were requested to provide comments. If comments were not received, it was assumed that there were none. A total of nine sets of comments were received from State agencies and local jurisdictions. A summary of their comments and recommendations is presented in the following paragraphs, along with actions taken to address them.

Arapahoe County was concerned that if it vacated on-project existing road ROW's prior to acquiring ROW for the prospective Cherry Creek crossing road, the county would be required to provide the DPOR with other recreation lands to replace the lands used for the crossing road ROW. This concern was also voiced by the DPOR. The Master Plan now states that the county must officially commit to vacating, not actually vacate, ROW's for abandoned roads on project lands prior to the Corps granting of an easement for the crossing road ROW. This wording is consistent with Greenwood Village's comment that the Corps should require the county to vacate ROW's for abandoned on-project roads and for roads whose functions would be replaced by the crossing road.

Table 4-1
Recipients of Final Draft, Updated Master Plan

Federal Agencies
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Soil Conservation Service

State Agencies/Representatives
Senator William L. Armstrong
Senator Timothy Wirth
Representative Daniel L. Schaefer
Representative Patricia Schroeder
Department of Health
Division of Parks and Outdoor Recreation
Division of Wildlife
Highway Department
State Engineer
State Forest Service
State Historic Preservation Officer
Water Conservation Board

Local Government Jurisdictions
Arapahoe County
Arapahoe Park and Recreation District
Cherry Creek Basin Water Quality Authority
Cherry Creek School District
City of Aurora
City of Cherry Hills Village
City and County of Denver
City of Greenwood Village
Denver Regional Council of Governments
Douglas County
South Suburban Metro Recreation and Park District
Tri-County Health Department
Urban Drainage and Flood Control District

Private Organizations
Colorado Water Congress
State Recreational Trails Committee

The City and County of Denver provided an update of proposed development at J.F. Kennedy Park. All information pertinent to development proposed on project lands was incorporated.

The City of Greenwood Village was concerned about the effect that raising the dam crest might have during a PMF event on buildings located

adjacent to Corps property, on Village Greens Park, and on the dam crest road. The last concern was also voiced by the DPOR. The Master Plan states that even without the dam raise, the PMF event would result in the lake rising so high that it would inundate many structures erected beyond the boundaries of existing fee lands and flowage easements. Although a dam raise would allow floodwaters during a PMF event to rise to higher elevations upstream from the dam, the dam raise would reduce the likelihood of the dam overtopping. The Feasibility Study: Hydrologic Improvement Assessment would identify increased flooding upstream from the dam and would include studies to assure compliance with environmental statutes. If a dam crest raise is included in the recommended plan, a Master Plan supplement will be prepared which will address the impacts of the recommended plan, including those on the dam crest road.

The City of Aurora was concerned about loss of wildlife habitat in the spillway area and impacts to nearby residents if the Corps decides to widen the spillway channel and/or construct a maintenance road in the bottom of the spillway channel. NEPA procedures will be followed, and these impacts will be addressed in EA's prior to any recommendations on these dam safety issues.

The Tri-County Health Department was concerned that creation of additional wetlands and detention ponds could create mosquito problems; the Corps will coordinate these activities with the Tri-County Health Department. Tri-County's recommendation that prairie dogs be dusted with insecticide prior to implementation of major control efforts has been included in the Master Plan.

The CCBWQA was concerned about stormwater runoff from all new roads at the project. The road west of the marina area has detention swales, and this concern will be included in the Corps' review prior to approving other new road plans. Some misleading statements in the Master Plan were corrected: any sewage in Cherry or Cottonwood Creeks

comes from septic tanks rather than sewage treatment plants; it was emphasized that water quality improvement measures have already begun; and the decrease in 1989 visitation to the SRA was only partly due to a new user fee to fund CCBWQA efforts. The Master Plan was updated regarding feasibility of potential in-reservoir water quality improvement measures based on the CCBWQA's 1989 revision of the "Cherry Creek Basin Water Quality Management Master Plan."

The Colorado State Engineer, Division of Water Resources, recommended that the Master Plan include provisions for possible alternatives, including acquisition and funding, of water supplies necessary to maintain a viable recreation pool while strict administration of water rights is in effect. The DPOR supported this position and felt that potential impacts of and solutions to the problem of potential drying up of the lake should be included in the Master Plan. It is the Omaha District's position that solutions to the potential problem of progressively lower lake levels are the responsibility of the State to identify, evaluate and fund; solutions which require Corps approval prior to implementation will be reviewed as they are proposed. Master Plan supplements will be prepared if needed.

The State of Colorado Department of Natural Resources, DOW, desired that no islands be created in the delta because the area was already overpopulated with geese. The island creation proposal in the draft Master Plan was removed. The suggestion that shallow ponds be developed to benefit ducks and other wildlife by digging into ground water on the south side of the lake was essentially included in the draft Master Plan proposal that areas of deeper open water within the marshy areas of the delta be created by dredging.

The State of Colorado Department of Natural Resources, DPOR, had a number of review comments. Based on DPOR comments, a number of minor changes were made. Reference to a storm warning system was deleted. Information on prairie dog controls, group picnicking reservations, and

entry fees for rifle range users was updated. Corrections were made regarding the year carrying capacity controls were first implemented, fire protection, potable water supply systems, and distribution of lake zoning maps. The meaning of "separate day-use opportunities" among the resource objectives for recreation lands was clarified. The term "adjudication" was changed to "administration" in several references to reservoir releases to satisfy downstream water rights. The DPOR indicated that it considered lessees to be among the "jurisdictions involved" which must be party to an amicable agreement on annexation if the Corps is not to oppose an annexation proposal. The DPOR desired the deletion of the projectwide resource objectives restricting location of game fields and intensive recreation development because the DPOR inferred that volleyball courts would have to be eliminated from the area near the lake and that no intensive recreation areas would be allowed adjacent to the project boundary. The term "game fields" refers to the types of team playing fields prohibited from development within the Cherry Creek SRA; the term does not include volleyball courts because they are allowed within the SRA. The wording of the resource objective which allows siting of intensive recreation uses adjacent to the project boundary was clarified to avoid misinterpretation. The DPOR suggested that the Master Plan include the need for replacement of old facilities, the need for utility support systems for each area of the SRA, and a statement that as recreation needs and technologies change, specific proposals listed may change. Inclusion of these suggestions in the Master Plan was determined to be unnecessary.

CHAPTER V

LAND CLASSIFICATIONS AND RESOURCE OBJECTIVES

LAND ALLOCATIONS

Land allocations identify the authorized purposes for which project lands were or are to be acquired. The entire Cherry Creek Lake project has a land allocation of Operations because all existing acreage was acquired to operate the project for flood control. No separable lands were acquired for purposes of recreation, fish and wildlife, or mitigation.

LAND CLASSIFICATIONS

All lands acquired for project purposes are classified by management categories to provide for development and resource management consistent with authorized project purposes and the provisions of NEPA and other Federal laws. The classification process refines the land allocations to fully utilize project lands and must consider public desires, legislative authority, regional and project-specific resource requirements and suitabilities. Management and use of the lands assigned to each land classification must be compatible with the Operations allocation. The land classifications are described below, and their locations are shown on plate 12.

Project Operations. This classification includes lands required for the structures, operations center, administrative offices, maintenance

compounds, and other areas that are used solely for project operations. Approximately 756 acres of land are classified as Project Operations; all are optimally used.

Recreation. This classification consists of land developed for intensive recreational activities. Approximately 591 acres of land are classified as Recreation; over 551 acres are optimally used, and 39.5 acres (the parcel on which the City and County of Denver currently holds a 1-year renewable, cancellable lease) are categorized as not put to optimum use.

Environmentally Sensitive Areas. This classification consists of areas where significant scientific, ecological, cultural, or esthetic features have been identified. Development of public use on lands within this classification is limited or prohibited to ensure that the sensitive areas are not adversely impacted. No project lands have been classified as environmentally sensitive areas. If wetlands currently located on project lands are filled for purposes deemed to be in the public interest, new wetlands created on project lands to replace them will receive this classification.

Multiple Resource Management. This classification, which applies to approximately 3,154 acres, includes lands managed for one or more of the following activities:

• Recreation - Low Density - These areas are managed for low-density recreation activities such as hiking, wildlife observation, nature study, and trail use. Approximately 3,154 acres are included in this subclassification, of which 3,144.1 acres are optimally used and 9.9 acres are categorized as underutilized. The parcels considered to be underutilized consist of 1.9 acres currently being disposed of by GSA which are included in the DPOR's lease and 8.0 acres, currently

included in Aurora's lease, which had been declared excess to project needs but were returned by GSA pending findings of the Hydrologic Improvement Assessment.

• Wildlife Management General - No project lands have this subclassification, but all project lands will be managed for fish and wildlife habitat in conjunction with other land uses. No hunting is allowed on project lands because of the Cherry Creek Lake project's urban location and high visitation.

• Vegetative Management - No project lands have this subclassification, but all project lands will be managed to protect and develop vegetative cover in conjunction with other land uses.

Easement Lands. This classification consists of lands for which the Corps holds an easement interest but not fee title. Planned use and management of easement lands will be in strict accordance with the terms and conditions of the easement estate acquired for the project. The Government has acquired easements on approximately 131 acres of land.

Management responsibilities by acreage for each land classification and for the lake at multipurpose pool level are presented in table 5-1.

Table 5-1
Land Classifications: Acreages and Managing Agencies
Cherry Creek Lake, Colorado

Classification	Total Acres	Managing Agency Corps	State	Local
Project Operations	756	580	130	46
Recreation	591	0	345	246
Multiple Resource Management	3,154	24	2,872	258
Lake at Elev. 5550 ft. m.s.l.	844	0	844	0
Total, Project Fee Lands	5,345	604	4,191	550
Easement Lands	131	131	na	na
Total Project	5,476	735	4,191	550

WATER USE ZONES

In 1988, over 1,000 visitors participated in water-based activities for each lake acre. To accommodate high water-use visitation without compromising safety, the DPOR has established and enforced several management policies. As explained in the Visitation and the Recreation Activities and Needs sections of chapter II, the DPOR has determined carrying capacities of the lake for boats and of the beach for swimmers. Even before carrying capacity controls became necessary, water use zones had been established within Cherry Creek Lake to promote safety, minimize conflicts between competing water-based activities, and maximize the number of visitors who could enjoy water-based activities simultaneously. These zones are depicted on a map distributed to boaters at the SRA and available to all SRA visitors; a copy of this handout is included as figure 2-11.

The water use zones are marked with buoys. Waterskiing is limited to the northern sector of the lake and must be in a counterclockwise direction around the centerline buoys. Water-ski takeoff and dropoff beach areas have been designated. Except for the ski beach and the designated swim area, the edge of the lake is limited to no-wake boating (speeds of 5 miles per hour or less.) A sailboarding area is designated in the vicinity of the sailboard beach, which is included within the no-wake zone on the west side of the lake.

RESOURCE OBJECTIVES FOR SPECIFIC LAND CLASSIFICATIONS

Resource objectives are attainable options for resource development and/or management which are consistent with authorized project purposes, Federal laws and directives, regional needs, resource capabilities, and expressed public desires. Meeting resource objectives is necessary if projectwide goals are to be achieved. The resource objectives which were developed for each land classification at the Cherry Creek Lake project are provided below.

RESOURCE OBJECTIVES FOR PROJECT OPERATIONS LANDS

- To maintain and operate project structures in a manner which allows them to effectively and safely fulfill project purposes.

- To provide for public use of project structures where such use is feasible and does not interfere with other project purposes.

- To accommodate uses by Federal or State agencies which are determined to be in the Federal interest.

- To provide an adequate area for maintenance facilities which are required to meet overall project objectives.

RESOURCE OBJECTIVES FOR RECREATION LANDS

- To provide opportunities for golfing, tennis, and participation in organized team sports on project lands separated from the main reservoir area by project structures or major roadways.

- To provide overnight camping opportunities to support identified camping demand for groups and individuals.

• To provide day-use opportunities, separate from overnight camping areas, for: swimming and sunbathing; pier and shoreline fishing; picnicking for individuals and for large groups; golfing; tennis; participation in organized team sports; and playground use.

• To accommodate visitor preferences for engaging in several activities in the same general vicinity.

• To provide lake access for boats.

• To provide marina facilities and services offered by a commercial concessionaire.

• To provide opportunities for sailboarding and waterskiing.

• To provide secure storage for boats and sailboards.

• To provide opportunities for the elderly and handicapped to participate in a variety of activities.

• To expand plantings of trees for shade and wildlife.

• To expand measures to control shoreline and soil erosion.

RESOURCE OBJECTIVES FOR ENVIRONMENTALLY SENSITIVE AREAS

• To avoid degradation or net loss of wetland areas.

• To create wetlands in Corps-designated areas on the project for wildlife habitat improvement, when determined to be appropriate.

• To preserve and/or restore wildlife habitat.

• To provide resource-oriented recreation opportunities in as natural an environment as possible.

RESOURCE OBJECTIVES FOR MULTIPLE RESOURCE MANAGEMENT AREAS

• To preserve and maintain at least 50 percent of project lands for low-density recreation use.

• To provide trail opportunities for interpretive programs, hiking, bicycling, and horseback riding.

• To provide safe opportunities for skeet and target shooting with firearms and for target archery.

• To provide opportunities for flying model planes and for dog trial training in areas which do not conflict with adjacent uses.

• To provide opportunities for winter sports such as tobogganing, sledding, cross-country skiing, and snowshoeing.

• To accommodate and support use of the land for hiking, bird watching, photography, nature study, wildlife observation, and/or the pursuit of peace and solitude.

• To provide a buffer between land uses which may be incompatible with each other.

• To exercise good stewardship practices by increasing the use of soil conservation measures and by maintaining, or allowing sponsors to enhance, wildlife habitat to ensure successful natural propagation of diverse fish and wildlife species.

• To provide sites contiguous to existing recreation areas or to the project boundary for future development which meet anticipated outdoor recreation demands, are appropriate for that area of the project, and do not adversely impact project operations or other project purposes.

CHAPTER VI

RESOURCE PLAN

The resource plan detailed in this chapter describes existing development and use of the natural and manmade resources at Cherry Creek Lake. Modifications of, and additions to, existing development are also proposed based on current needs and needs anticipated for the near future. Development proposed in this Master Plan is consistent with resource characteristics, suitabilities, and limitations; is compatible with adjacent land uses; is considered appropriate for a Corps multipurpose reservoir project; is responsive to visitor needs and management concerns; will comply with Federal, State, and local laws and regulations; and is determined to be in the Federal interest.

FACILITIES AND DEVELOPMENT NEEDS

The Cherry Creek Lake project can be divided into a number of functionally or geographically separate areas. Facility descriptions and development needs of these areas are provided below. The rationale for development needs is included if it was not already provided in chapter II. The areas are numbered in counterclockwise order, beginning on the left bank of the outlet channel. The area identification numbers are shown on the Facility Locations map, plate 11. The facilities are shown on the Development Plan, plates 5 through 9.

1. J.F. KENNEDY GOLF COURSE (Plate 7)

Use of Area. Kennedy Golf Course is one of the busiest municipal courses in the Denver metropolitan area, and several holes of the course are located on Cherry Creek Lake project lands downstream from the dam. This area is under lease to the City and County of Denver for public

park and recreation purposes until August 2011. It has a land classification of Recreation because of high visitation and its development as a portion of the golf course.

Description of Area. The golf course is accessed by off-project roads. The Cherry Creek outlet channel flows through this area. Only golf holes and a hiking/bicycle trail have been developed in this area; facilities such as the clubhouse, parking lot, and maintenance yard are located off project lands. No facilities in this area have been cost-shared with the Corps. Only 18 holes of the originally proposed 27 holes have been developed. The 27-hole golf course plan is presented as figure 6-1.

Development Needs. The following development has been identified as needed for this area within 5 years:

- Upgrading or renovation of the irrigation system,
- Additional boundary landscaping, and
- Expansion of the golf course to 27 holes.

2. J.F. KENNEDY SOCCER COMPLEX (Plate 7)

Use of Area. This downstream area has been partially developed with soccer fields. This 39.5-acre parcel of land was declared excess to project needs and was turned over to GSA for disposal; however, management was returned to the Corps in 1986 pending completion of the Hydrologic Improvement Assessment. The property is currently leased to the City and County of Denver for public park and recreation purposes on a yearly outgrant. It has a land classification of Recreation because of high visitation and its development as a city park.

Description of Area. This area is accessed by off-project roads. Existing facilities consist of soccer fields, parking, and portable toilets.

N
LEGEND
CITY AND COUNTY OF DENVER
DEPARTMENT OF PARKS AND RECREATION
JOHN F. KENNEDY
GOLF COURSE
DEVELOPMENT PLAN
REVISIONS
CHERRY CREEK RESERVOIR

FIGURE 6-1

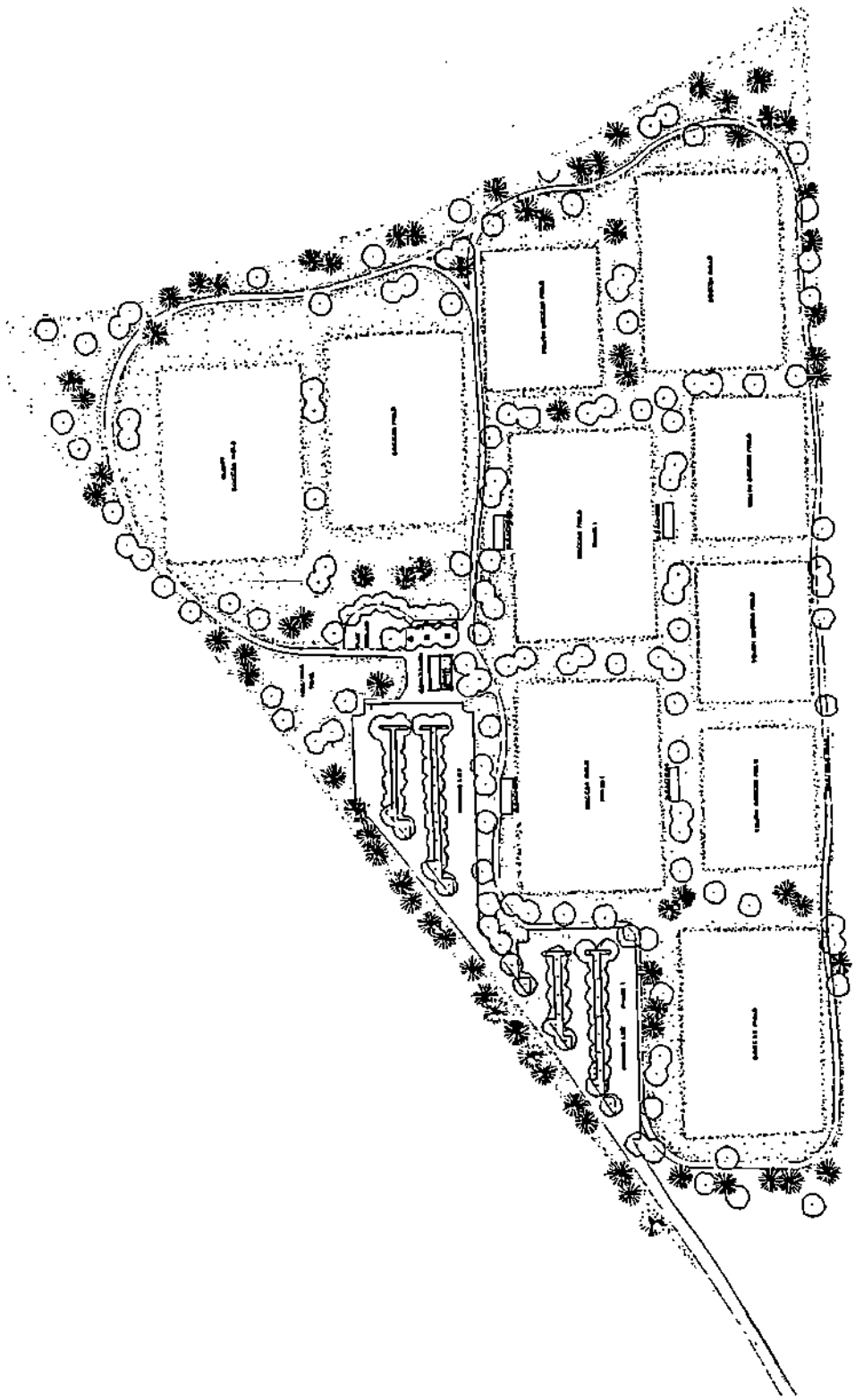
Development Needs. The City and County of Denver proposes the following additional development, a concept plan of which is presented as figure 6-2, to meet existing needs if the Government retains this parcel rather than disposing of it:

- Development of additional soccer fields,
- Installation of a hiking/bicycle trail,
- Construction of a concession building with flush toilets,
- Installation of a playground,
- Paving of the existing parking lot,
- Development of additional paved parking, and
- Construction of bleachers.

3. VILLAGE GREENS PARK (Plate 7)

Use of Area. This area has been developed as a portion of Village Greens Park by the City of Greenwood Village. It is leased to the City of Greenwood Village for public park and recreation purposes until August2007. The area has a land classification of Recreation because of high visitation and its development as a city park.

Description of Area. This 27-acre area, the eastern portion of Village Greens Park, is located west of the west abutment of the dam. Access is from Union Avenue. The western portion of Village Greens Park has been developed on an adjacent 25-acre parcel which the City leases from the Cherry Creek School District. The City has developed ball fields, a soccer/multipurpose field, a flush comfort station, a concession, a playground, hiking/bicycle trails, and parking on project lands and has developed ball fields, multipurpose/soccer fields, and a



KENNEDY PARK SOCCER
COMPLEX DEVELOPMENT PLAN

FIGURE 6-2

hiking/bicycle trail on the adjacent off-project parcel. Three ball fields, two multi-purpose fields, and support facilities planned for the northern portion of the on-project parcel have not yet been developed. The development plan is presented as figure 6-3.

Development Needs. Greenwood Village owns a 52-acre parcel of land adjacent to the northern boundary of Village Greens Park. In June 1989, Greenwood Village requested a lease on a 32-acre parcel between I-225 and the dam which was under lease to the City and County of Denver but which can be accessed only through Village Greens Park. Greenwood Village desires to develop a municipal golf course on the 52-acre parcel, the 32-acre parcel, and the currently undeveloped northern portion of the 27-acre parcel which it leases from the Corps. The 32-acre parcel was withdrawn from the area leased to the City and County of Denver with its consent on 21 May 1990 and was added to Greenwood Village's lease by a supplemental lease agreement dated 14 September 1990. The DPOR desires to construct a hiking/bicycle trail along the downstream toe of the dam and across the 32-acre parcel to connect the DPOR's hiking/bicycle trail east of the outlet works with the trail in Village Greens Park.

4. WEST ENTRANCE STATION (Plate 7)

Use of Area. This is the western entrance for vehicles to the Cherry Creek SRA, the area under lease to the State of Colorado DPOR for public park and recreation purposes until December 2011. The west entrance station is located approximately 300 feet inside the western boundary of the SRA. This area has a land classification of Project Operations because it is from this facility that DPOR personnel control visitor access, collect park user fees, implement carrying capacity regulations, and provide information to the public.

Description of Area. The west entrance station (West Gate Kiosk) is located adjacent to the marina road. A chemical toilet is located south of the entrance station. According to the DPOR, only on rare occasions

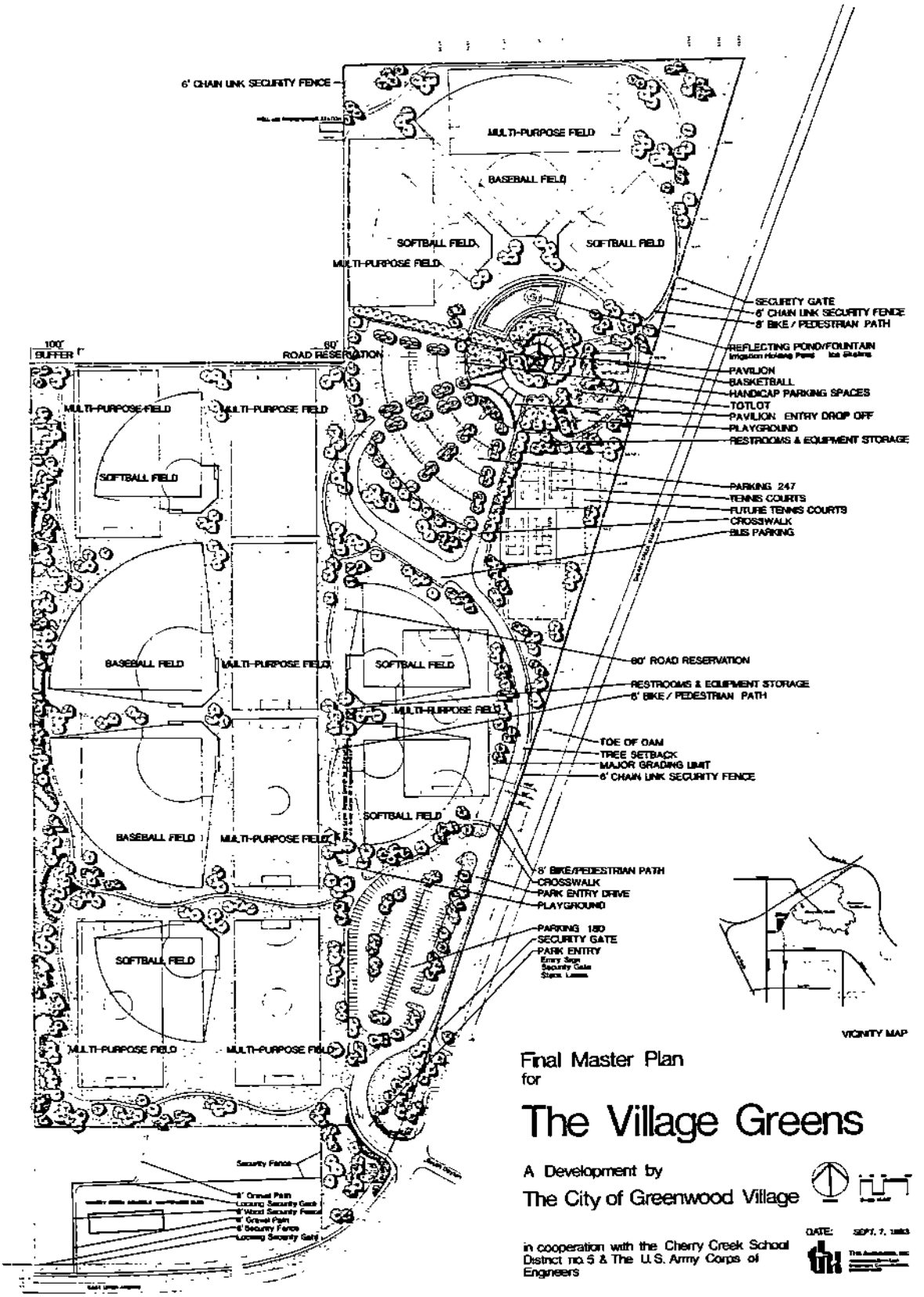

6' CHAIN LINK SECURITY FENCE
MULTI-PURPOSE FIELD
BASEBALL FIELD
SOFTBALL FIELD
SOFTBALL FIELD
MULTI-PURPOSE FIELD
SECURITY GATE
6' CHAIN LINK SECURITY FENCE
8' BIKE / PEDESTRIAN PATH
REFLECTING POND/FOUNTAIN
PAVILION
BASKETBALL
HANDICAP PARKING SPACES
TOTLOT
PAVILION ENTRY DROP OFF
PLAYGROUND
RESTROOMS & EQUIPMENT STORAGE
100' BUFFER
80' ROAD RESERVATION
MULTI-PURPOSE FIELD
MULTI-PURPOSE FIELD
SOFTBALL FIELD
PARKING 247
TENNIS COURTS
FUTURE TENNIS COURTS
CROSSWALK
BUS PARKING
BASEBALL FIELD
MULTI-PURPOSE FIELD
SOFTBALL FIELD
80' ROAD RESERVATION
RESTROOMS & EQUIPMENT STORAGE
8' BIKE / PEDESTRIAN PATH
MULTI-PURPOSE FIELD
TOE OF OAN
TREE SETBACK
MAJOR GRADING LIMIT
6' CHAIN LINK SECURITY FENCE
BASEBALL FIELD
MULTI-PURPOSE FIELD
SOFTBALL FIELD
8' BIKE/PEDESTRIAN PATH
CROSSWALK
PARK ENTRY DRIVE
PLAYGROUND
PARKING 180
SECURITY GATE
PARK ENTRY
SOFTBALL FIELD
MULTI-PURPOSE FIELD
MULTI-PURPOSE FIELD
Security Fence
VICINITY MAP
Final Master Plan
for
The Village Greens
A Development by
The City of Greenwood Village
in cooperation with the Cherry Creek School District no.5 & The U.S. Army Corps of Engineers
DATE: SEPT. 7, 1983

FIGURE 6-3

do vehicles need to wait in line to enter the SRA because of carrying capacity restrictions. When this happens, a waiting line is formed on the Cherry Creek High School parking lot, which is adjacent to the SRA south of the west entrance road.

Development Needs. No development needs have been identified for this area.

5. MARINA AREA (Plate 7)

Use of Area. This area of the Cherry Creek SRA includes a marina, boating, and picnicking area. It is located adjacent to the dam on the west side of the lake. The marina is operated by a concessionaire under terms of a third-party agreement. It contains 149 slips, all of which are rented every year; lessons in waterskiing and sailing are available. The DPOR water patrol station is based at the marina. Many regattas and other special events are held here. Most boats using the boat ramp are nonmotorized. The area has a land classification of Recreation because of high visitation and extensive development.

Description of Area. The marina road can be accessed from the west entrance road or the perimeter road. The marina area can also be accessed by bicycle trail and by boat. A major redevelopment of the area, a portion of which is proposed for cost-sharing, began in 1989 and was completed in 1990. In 1989, a four-lane boat ramp was constructed to replace a three-lane ramp and the following development was initiated: rehabilitation of "The Sails" building into a handicapped-accessible toilet building with showers and space heating; construction of a plaza with a food concession building, indoor dining area, benches, picnic tables, and shelters; and installation of outdoor lighting. Other facilities at the marina area include a floating marina concession/office building, four courtesy docks, a volleyball court, a large parking area, potable water, and a lift station.

Development Needs. Many needs identified in 1988 were met by development initiated in 1989. The following additional development is needed and is expected to occur within 5 years:

- Construction of an information kiosk,
- Landscaping,
- Installation of bicycle trail access,
- Installation of shoreline erosion protection,
- Extension and repair of the jetty,
- Construction of a picnic shelter at the end of the jetty, and
- Development of handicapped-accessible fishing pods near the dam face.

6. WEST SIDE PICNIC AREA (Plate 7)

Use of Area. This area, located south of the marina area within the Cherry Creek SRA, is used primarily for picnicking, shoreline fishing, and ice fishing. It has a land classification of Recreation because of high visitation and extensive development.

Description of Area. Ten small picnic shelters, the west side shade shelters, are located near the shore of the lake. They are accessed from the perimeter road by a divided roadway which allows for parallel parking and can also be accessed by bicycle trail. Hobie Beach, which extends south from the boat ramp at the south end of the marina area and lies below the northern four west side shade shelters, is used for fishing as well as for beaching small sailcraft and catamarans. The shoreline near the southern six west side shade shelters is riprapped and is favored for shoreline fishing. In 1989, the roads and parking

areas west of the west side shade shelters were resurfaced, and a 4-foot-wide bicycle lane was added to some sections of the resurfaced road. Redevelopment of the Hobie Hill Shelter area north of the west side shade shelters and west of the marina was initiated in 1989 to accommodate increased picnicking use by individuals and groups. As part of the redevelopment, the northwest end of the perimeter road was relocated westward, and two individual/group picnic shelter clusters (the Hobie Hill Shelters) were constructed. Other facilities at the west side picnic area include vault toilets and potable water. Much of the redevelopment which was initiated in 1989 and/or is planned for the near future is proposed for cost-sharing.

Development Needs. Some needs identified in 1988 were met by development in 1989. The following additional development is needed and is expected to occur within 5 years:

- Construction of a flush comfort station west of the west side shade shelters,

- Landscaping and a sprinkler system near the west side shade shelters,

- Rehabilitation of the Hobie Hill flush comfort station,

- Construction of a third Hobie Hill Shelter,

- Landscaping and a sprinkler system near the Hobie Hill Shelters,

- Installation of a playground near the Hobie Hill Shelters,

- Installation of a paved parking area with access from the marina road near the Hobie Hill Shelters,

• Installation of a bicycle trail access to the Hobie Hill facilities,

• Conversion of the divided road west of the west side shade shelters to two cul-de-sacs with parallel parking,

• Installation of shoreline erosion protection, and

• Development of picnicking facilities south of the west side shade shelters, in a manner compatible with the riparian habitat, if and when justified by picnicking demand.

7. MOUNTAIN LOOP (Plate 7)

Use of Area. This small loop provides fishing access to the lake. It is located in the Cherry Creek SRA south of the west side picnic area. It has a land classification of Recreation because of its location between the west side shade shelters and the sailboard beach, which are two heavily visited facilities.

Description of Area. Access is by the perimeter road or bicycle trail. The major facility in the area is a small gravel loop which provides parking for fishermen. A vault toilet is also located here.

Development Needs. The following development was identified as needed and is expected to occur within 5 years:

• Installation of shoreline erosion protection and

• Upgrading of the vault toilet.

8. LAKE LOOP (Plate 7)

Use of Area. This large loop is located in the Cherry Creek SRA east of Mountain Loop. Lake Loop offers opportunities for picnicking,

fishing, and sailboarding. It has a land classification of Recreation because of high visitation and extensive development.

Description of Area. Access is by the perimeter road or by bicycle trail. Parking areas are located along the loop and in a teardrop parking area extending north from the loop; the loop and parking areas were paved in 1989. A sailboard concession facility provides sailboard lessons, rentals, and storage of sailboards and sails. Facilities include sailboard concession buildings, picnic sites, vault toilets, a volleyball court, and parking areas. The Prairie Dog Observation Area, which has a small parking area, is located across the perimeter road from Lake Loop.

Development Needs. The following development has been identified as needed for this area and is expected to occur within 5 years:

- Construction of a flush comfort station,
- Installation of utility lines,
- Provision of potable water,
- Construction of shade shelters, and
- Concession expansion appropriate for the area if justified by increased visitation.

9. PRAIRIE LOOP (Plates 6 and 8)

Use of Area. This small loop is located southeast of Lake Loop within the Cherry Creek SRA. Prairie Loop serves as a fishing access area and trailhead for the new nature trail which was developed east of the loop in 1989. This area has a land classification of Recreation because of relatively high visitation.

Description of Area. Access is by the perimeter road or bicycle trail. Parking areas are located along the loop, which is surfaced with gravel. Picnic sites are also located here.

Development Needs. The only development identified as needed for this area within 5 years is construction of shade shelters.

10. NATURE TRAIL AREA (Plates 6 and 8)

Use of Area. This area is located in the Cherry Creek SRA east of Prairie Loop. DPOR personnel conduct nature tours and talks here. This area has a land classification of Multiple Resource Management: Recreation - Low Density because of relatively low visitation, minimal development, and the nature of use.

Description of Area. A gravel nature trail 0.75-mile long and interpretive signs are the only facilities in this area. The trailhead and parking area for the nature trail are located at Prairie Loop. The trail was constructed here in 1989 because the old nature trail at the south end of the lake was frequently inundated. The trail runs along Cottonwood Creek and provides opportunities for observation and interpretation of the prairie, riparian, wetlands, and aquatic biotic communities.

Development Needs. The only development identified as needed for this area within 5 years is installation of benches along the trail.

11. SRA OPEN SPACE AREA (Plates 6, 7, 8, and 9)

Use of Area. A majority of the project's land and water acreage is included in this area, which is included in the DPOR's lease. This area is what distinguishes the SRA from a city park. To ensure that the character of the SRA is maintained, it is the policy of the DPOR that approximately 60 percent of the SRA shall be maintained as a buffer and open space. The open space area contrasts with the intensive recreation use elsewhere on the project and with the urbanization surrounding the

project and provides visitors with a place for solitude and quiet reflection. Equestrian trails and hiking/bicycle trails traverse this area. Opportunities are also provided for sightseeing, nature study, wildlife observation, nontrail hiking, and photography. This area has a land classification of Multiple Resource Management: Recreation - Low Density because of low visitation and character of use. The delta area and the riparian habitat with associated wetlands in the Cherry Creek flood plain have been designated as an environmentally sensitive component of this area; the area is still undergoing change because of the meandering of Cherry Creek.

Description of Area. This area includes grassed uplands, wooded bottomlands, riparian areas, and wetlands. It is adjacent to the lake in the delta area but is separated from the east and west sides of the lake by intensive recreation areas. The nature trail area, model airplane field, mountain biking trailhead, rifle range, dog trial area, group picnic area, horse stables, and some maintenance areas are surrounded by this open space because of safety, noise, privacy, and/or incompatibility with intensive recreation uses. The bicycle trail in the vicinity of Shop Creek had to be relocated to accommodate the drainage improvements installed in 1988 and 1989; a small parking area was developed west of the perimeter road near its crossing of Shop Creek for use as a bicycle trailhead. The environmentally sensitive component is divided into two sections by the perimeter road and adjacent bicycle trail; the only facilities currently in this component are nature, bicycle, and equestrian trails.

Development Needs. The following development was identified as needed and is expected to occur within 5 years:

- Planting of additional shade trees along drainageways,

- Development of additional equestrian trails,

• Development of additional hiking/bicycle trails,

• Possible development of designated mountain biking trails if the horse stable is relocated and mountain bikes are no longer allowed to use the equestrian trails west of the Cherry Creek bed, and

• Possible development of picnic sites by scattered picnic tables near the banks of Cherry Creek adjacent to roads and trails if warranted by future picnicking demands.

12. MODEL AIRPLANE FIELD (Plate 8)

Use of Area. This area of the Cherry Creek SRA contains one of the older model airplane fields in the Denver metropolitan area. Five model aircraft can be airborne at one time. The area has a land classification of Multiple Resource Management: Recreation - Low Density because visitation is relatively low and because this facility requires a large buffer zone for noise and safety considerations.

Description of Area. Access from the perimeter road is provided by a gravel loop, which contains parking areas. The two runways are located adjacent to the loop on relatively high and level ground approximately 1,000 feet south of Prairie Loop and 800 feet north of Belleview Avenue. The design and location of the runways conform to MRD's 3 October 1986 Guidelines for Management of Areas for Radio-Controlled Model Aircraft, Vehicles and Boats at Water Resources Development Projects in the Missouri River Division. Other facilities are a vault toilet installed in 1988, picnic tables, and picnic shelters.

Development Needs. The following development was identified as needed and is expected to occur within 5 years:

- Paving of the access road and parking areas and

- Resurfacing of the runways.

13. FEDERAL RESEARCH FACILITY (Plate 8)

Use of Area. Although this area is included in the Cherry Creek SRA, it was used by the University of Denver for various research projects for the Federal Government under a permit to the Department of the Navy, with an expiration date of 30 June 1991. The university completed its research for the Navy and, with the permission of the Navy and the Corps, then used these facilities for research sponsored by other Federal agencies. This area has a land classification of Project Operations because of its is use for research for the Federal Government and because there are no facilities for public use on the site.

Description of Area. The 90.8-acre area is accessed by a gravel road which extends 1,600 feet south from Belleview Avenue. A small fenced site at the end of the gravel road contains a building used as a research office area, a garage, and several storage sheds.

Development Needs. The Department of the Navy does not desire to renew its permit and has undertaken restoration of the area. When the Navy has completed its restoration responsibilities, the DPOR will assume management of the area. Under DPOR management, it is expected that bicycle and/or equestrian trails would be developed in this area, and the research buildings may be used for dry boat storage by the marina concessionaire under terms of a third-party agreement. When the DPOR assumes management, this area will have a land classification of Multiple Resource Management: Recreation - Low Density because of the types of public use anticipated.

14. DPOR MAINTENANCE RESIDENCE (Plate 9)

Use of Area. This area of the Cherry Creek SRA provides living quarters for DPOR personnel and maintenance storage. It has a land

classification of Project Operations because the facilities located here are used for operating and maintaining the project.

Description of Area. This area is located approximately 3,500 feet south of the rifle range. Access is provided by East Orchard Road, a gravel road which extends 2,500 feet west of Parker Road and ends at the maintenance residence driveway. The area is completely fenced and contains a house, a trailer, a garage, and storage sheds.

Development Needs. No development needs have been identified for this area.

15. RIFLE RANGE (Plate 9)

Use of Area. The rifle range is included in the Cherry Creek SRA and is operated by a concessionaire under terms of a third-party agreement. Patrons can shoot at outdoor targets and purchase ammunition and supplies. The rifle range is located immediately west of Jordan Road, far from other developed recreation facilities. This area has a land classification of Multiple Resource Management: Recreation - Low Density because of relatively low visitation and the large buffer area required for noise and safety considerations.

Description of Area. A gravel access road and parking lot are located north of a concession building. The concession structure contains office and storage space and a shelter with benches to accommodate patrons who are shooting. The outdoor shooting ranges are located south of the concession building. There are 22 spaces on the rifle range and 10 spaces on the shotgun range. The area is completely fenced for safety; berms on the east, south, and west provide for safety and noise reduction. The range meets the safety standards of the "National Rifle Association Range Manual." A vault toilet is also located here.

Development Needs: The following development was identified as needed and is expected to occur within 5 years:

- Upgrading of the vault toilet,
- Upgrading of the shotgun range, and
- Addition of an outdoor archery range.

16. MOUNTAIN BIKE TRAILHEAD (Plate 9)

Use of Area. This portion of the Cherry Creek SRA has been converted from a nature trail area to a mountain biking trailhead. This area is located adjacent to the perimeter road just west of the Cherry Creek streambed. It has a land classification of Multiple Resource Management: Recreation - Low Density because visitation is relatively low and it has few developed facilities.

Description of Area. This area contains the old gravel nature trail, 0.5-mile long, which was abandoned because of frequent inundation. A gravel parking area is located north of the perimeter road and west of the Cherry Creek streambed. A nature study shelter is located near the streambed, northwest of the parking area. The mountain biking trailhead is located at the bicycle trail, across the perimeter road from the parking area.

Development Needs. No development needs have been identified for this area.

17. DOG TRIAL AREA (Plate 9)

Use of Area. This training site, located near the southeast corner of the SRA, provides the public with an area to exercise dogs and/or train them for events and competitions. This area has a land

classification of Multiple Resource Management: Recreation - Low Density because of the relatively low visitation, few developed facilities, and nature of use.

Description of Area. A short gravel drive and large gravel parking area are accessed from Parker Road. A fence surrounds the parking area and the large dog training field to the south. A vault toilet is located adjacent to the parking area.

Development Needs. If a Cherry Creek crossing road is constructed and Jordan Road is consequently closed to through traffic, the following development has been identified as needed and is expected to occur within 5 years:

- Relocation of the dog trial area to the south end of the SRA, with access from Jordan Road, at a site where it would not interfere with equestrian activities;

- Reversion of the dog trial area to general low-density recreation uses without need for access and parking from Parker Road; and

- Closing of the existing parking area to public use after the dog trial area is relocated.

18. 12 MILE HOUSE GROUP PICNIC AREA (Plate 9)

Use of Area. This area of the Cherry Creek SRA accommodates group picnicking on a reservation basis. This area is very popular from May through August for company picnics, family reunions, and weddings. It is located in the Cherry Creek SRA south of the perimeter road and east of the Cherry Creek streambed. This area has a land classification of Recreation because of high visitation and extensive development. It was sited away from other intensive-use recreation areas to provide privacy.

Description of Area. A paved access road with adjoining parking areas runs north and east of the group picnic area and ends in a turnaround southeast of the area. The 12 Mile House group picnic area is in a relatively secluded setting, with Cherry Creek's riparian woodlands on the southwest and the DPOR maintenance compound 300 feet to the northeast. Facilities include a group shelter with flush toilets at each end, vault toilet, volleyball court, playground equipment, potable water, landscaping, and paved pathways between facilities.

Development Needs. The following development has been identified as needed and is expected to occur within 5 years:

- Resurfacing of the road and parking areas,

- Construction of an additional group picnic shelter with flush toilets near the turnaround, and

- Construction of an additional parking lot.

19. DPOR MAINTENANCE COMPOUND (Plate 9)

Use of Area. This area contains the majority of the DPOR's maintenance facilities for the Cherry Creek SRA. It is located near the eastern boundary of the SRA north of the group picnic area. This area has a land classification of Project Operations because the facilities located here are used for operating and maintaining the project.

Description of Area. Access from the perimeter road is provided by a gravel road 1,800 feet long which was resurfaced in 1989. A large gravel parking area is located north of the fenced compound. The compound contains a maintenance/shop building, boat yard, and storage sheds for vehicles, boats, equipment, and materials. A trailer used as a ranger office is located outside the fenced area.

Development Needs. The following development was identified as needed and is expected to occur within 5 years:

- Installation of natural gas utilities and

- Relocation of the trailer or relocation of the ranger office equipment and alternative use of the trailer in order to centralize administrative functions.

20. HORSE STABLES (Plate 6)

Use of Area. This area of the Cherry Creek SRA provides facilities for visitors to participate in horseback riding activities and is the trailhead for the SRA's system of equestrian trails. It is located east of the perimeter road and south of Quincy Avenue. The stables are operated by a concessionaire through a third-party agreement. Horse boarding, rental horses, trail rides, riding lessons, dinner rides, hayrack rides, sleigh rides, and square dances are available. The area has a land classification of Multiple Resource Management: Recreation - Low Density because of the relatively low visitation and the need for the stables to be located away from intensive-use recreation areas for reasons of safety, odor, and appropriateness of a rural setting for horseback riding activities.

Description of Area. The horse stable area contains a stable with an office and five stalls for boarded horses, three corrals that are used by horses which are boarded or available for rent, a portable toilet, potable water, a small group picnic site with a shade shelter, and equestrian trails.

Development Needs. The following development was identified as being needed and was expected to occur within 5 years:

- Construction of additional equestrian trails, especially to the south and west of the lake;

• Relocation of the stable area to an area between Jordan Road and the Cherry Creek streambed, if Jordan Road is closed to through traffic as a result of construction of the proposed Cherry Creek crossing road;

• Restoration of the old stable area with prairie grasses after relocation;

• Construction of public corrals at the new stable area; and

• Construction of a noncost-shared equestrian cross-country course with jumps after the stable area is relocated.

21. EAST ENTRANCE STATION (Plate 6)

Use of Area. This is the most frequently used entrance to the Cherry Creek SRA. The east entrance station is located 800 feet west of Parker Road. The area has a land classification of Project Operations because it is from this facility that DPOR personnel control visitor access, collect park user fees, implement carrying capacity regulations, and provide information to the public.

Description of Area. The east entrance station used to be accessed directly from Parker Road. In 1986, a new east entrance road was constructed by the Colorado State Department of Highways between the station and a point on Parker Road approximately 0.5 mile north of the station. This road has eliminated traffic problems on Parker Road associated with visitors waiting to enter the SRA during times when carrying capacity has been reached. The area contains an entrance station (East Gate Kiosk), ranger office with toilet (East Gate Office), small parking area, and AM radio transmitter.

Development Needs. Installation of natural gas utilities for space heating is the only development need identified for the east entrance area.

22. EAST SIDE BOAT RAMP AREA (Plate 6)

Use of Area. This area of the Cherry Creek SRA provides facilities for boating and jetskiing. It is located on the east side of the lake north of Quincy Avenue. Most boats using the ramps are motorized and are used for either waterskiing or boat fishing. The ramps are heavily used, and boats usually have to wait in line to launch on weekends. Jet-ski rentals are provided by a concessionaire under terms of a third-party agreement. The east side boat ramp area has a land classification of Recreation because of high visitation and extensive development.

Description of Area. The east boat ramp area can be accessed from the south by the perimeter road or from the north by the road leading to the swimbeach complex. Facilities include two two-lane boat ramps, a four-section courtesy dock, a large parking area for vehicles towing boat trailers, a building containing the jet-ski rental concession, a small picnic shelter, and a vault toilet.

Development Needs. The following development was identified as needed and is expected to occur within 5 years:

- Construction of a flush comfort station or an additional vault toilet,

- Resurfacing of the road and parking lot,

- Expansion of the parking lot to accommodate jet-skiers' vehicles,

- Expansion of the southern ramp to four lanes and removal of the northern ramp, and

- Landscaping.

23. EAST SIDE SHADE SHELTER AREA (Plate 6)

Use of Area. This area is a popular fishing and picnicking area.

It is located in the Cherry Creek SRA on the east side of the lake north of the east boat ramps. This area has a land classification of Recreation because of high visitation and extensive development.

Description of Area. Eleven small picnic shelters, the east side shade shelters, are located between the shore of the lake and a divided access road which provides parking and runs parallel to the shore. A heavily used handicapped-accessible fishing pier with a small parking area is located south of the shelters. A vault toilet with a handicapped-accessible path is also located in this area.

Development Needs. The following development was identified as needed and is expected to occur within 5 years:

- Upgrading of the vault toilet,
- Installation of turf grass and a sprinkler system,
- Installation of additional picnicking facilities east of the divided access road, and
- Resurfacing of the road and parking lot.

24. SWIMBEACH COMPLEX (Plate 6)

Use of Area. This is the most frequently visited area in the Cherry Creek SRA. Opportunities for swimming, sunbathing, waterskiing, picnicking, and sand volleyball are provided. A concession sells food, beach toys, and sundries under terms of a third-party agreement. The swimbeach complex also contains a trailhead for the bicycle trail. This area has a land classification of Recreation because of high visitation and extensive development.

Description of Area. The swimbeach complex is located north of the east side shade shelters. It can be accessed by paved roads from the

east entrance station, the east side shade shelters, or the campground and by bicycle trail. There are two beaches. The northern beach is the swim beach. Playground equipment and sand volleyball courts are located on the beach. A bathhouse, a first aid station, a beach/food concession building, and potable water are located adjacent to the beach. The southern beach was once used for swimming but is now used as a water-ski takeoff and dropoff area. East of this beach and southwest of the swim beach are potable water, a flush comfort station constructed in 1987, and the Smoky Hill Shelter (converted from the old bathhouse in 1983). The Smoky Hill Shelter is used for interpretive programs and reservation group picnicking and is used by hikers and bicyclists as a rest stop or for picnicking. Between the Smoky Hill Shelter and the beaches lie approximately 3 acres of turf that are used by sunbathers when the swim beach is crowded; a sprinkler system was installed here in 1989. Two large parking lots are located near the beaches. A shelter used as a trailhead for the bicycle trail is located south of the southern parking lot.

Development Needs. The following development has been identified as needed for this area and is expected to occur within 5 years:

- Resurfacing of parking lots and roads,
- Installation of natural gas utilities for space heating,
- Initiation of bicycle rentals,
- Construction of shade shelters at the swim beach, and
- Construction of a ranger office with showers at the swim beach.

The only development identified as being potentially needed more than 5 years in the future is construction of an additional outdoor swimming area with turf grass and a sand beach. The swimming area would

not be hydrologically connected to Cherry Creek or Cherry Creek Lake and would have its own system for draining, filtering, and chemically treating the water. No preliminary site has been selected, but the swimming area would be located in an area appropriate for intensive recreation activities to maintain as many large tracts of the SRA in open space as possible.

25. CAMPGROUND (Plates 5 and 6)

Use of Area. This area provides overnight camping opportunities for individuals or groups. A variety of facilities support car, tent, and trailer camping. The area has a land classification of Recreation because of high visitation and extensive development.

Description of Area. The campground is separated from day use areas. It is separated from the swimbeach complex by a paved road which runs from the east entrance road to Tower Loop; this road provides access to the campground. Land designated for low-density recreation activities lies on the remaining sides of the campground, providing a buffer area. Access within the campground is provided by five loop roads (A, B, C, D, and E Loops). Campers' vehicles are parked on pull-in trailer camping pads or pads along the side of the loop roads. The loop roads and camping pads were resurfaced in 1989. All campsites have a table, grill, and access to potable water. There are no electrical hookups. Five campsites at D Loop have been designated as a group camping area. A and C Loops share the Old Master Washhouse with laundry facilities; B Loop has a flush comfort station; E Loop has the New Master Washhouse, a flush comfort station with space heating which was constructed with cost-shared funds in 1987; and D Loop has a flush comfort station. Six shade shelters are located in the campground. An amphitheater is located near the Old Master Washhouse. A dump station which can accommodate two trailers at a time and a sewer lift station are sited west of the campground.

Development Needs. The following development has been identified as needed and is expected to occur within 5 years:

- Construction of a flush comfort station with space heating at A Loop,
- Installation of natural gas utilities,
- Installation of additional shade shelters,
- Construction of a road connecting the east entrance road with the campground,
- Upgrading of the trailer dump station, and
- Installation of electrical hookups at one or more loops.

As shown on plate 5, most of the campground is included in the spillway entrance. As discussed in the Spillway Function section of chapter II, no roads, trails, or other development can occur in the excavated portion of the spillway entrance northeast of the campground; the top of structures or trees in the portion of the campground included in the spillway entrance can not exceed the spillway crest elevation. The proposed development meets these criteria.

26. DPOR PARK HEADQUARTERS (Plates 5 and 6)

Use of Area. This is the DPOR's main administration building in the Cherry Creek SRA. The Park Manager, Assistant Park Manager, and clerical staff have offices here. It is located in the campground between A and B Loops north of the main campground circulation road. This area has a land classification of Project Operations because the facilities located here are used for operating and maintaining the project.

Description of Area. The area consists of an office building and small parking lot. Access is by the main campground circulation road. Parking stalls are located adjacent to this road in front of the park headquarters.

Development Needs. The DPOR has indicated that a central office complex would facilitate the consolidation of five separate office facilities. Consolidation should provide for more effective and economical management. No site has been determined yet, but a location adjacent to one of the maintenance compounds is contemplated. After the headquarters office is relocated, the DPOR would like to use the old headquarters building for campground administration.

27. SPILLWAY CHANNEL (Plate 5)

Use of Area. This channel functions as the emergency spillway to evacuate floodwaters during a design flood event. The upstream portion of the spillway, west of Parker Road, is included in the Cherry Creek SRA. A bicycle trail parallels the west side of Parker Road; campers frequently hike in this portion of the spillway; and an equestrian trail is planned to cross this area to connect the SRA equestrian trails with Denver's equestrian trail on the west side of Parker Road north of I-225. The portion of the spillway channel between Parker Road and Chambers Road is not leased. The segment downstream from Chambers Road is included in the 330 acres leased to the City of Aurora for public park and recreation purposes until September 2004. Aurora plans to leave the spillway channel east of Chambers Road as an open space area. Limitations to development in the spillway channel, entrance, and exit are discussed in the Spillway Function section of chapter II.

Description of Area. The spillway channel is an excavated trapezoidal channel discharging into West Toll Gate Creek. The sides have slumped from erosion in some places, and the spoil piles containing the material excavated to form the channel remain in place along the edge of the spillway channel. Because the channel is difficult to

maintain, proper drainage has not been ensured and wetlands with open-water areas have formed in much of the bottom of the spillway channel. Trees and brush which had grown on the bottom and lower side slopes of the spillway channel were removed in 1983 and 1987; new tree growth in these previously cleared areas will be removed in 1991 and then periodically, as necessary. The channel is crossed by Parker Road, Chambers Road, and a water line. This area has a land classification of Project Operations because the spillway structure is an essential component for operation of the project.

Development Needs. As discussed in the Spillway Maintenance for Hydraulic Improvement section of chapter III, some method of improving hydraulic capacity of the spillway channel is needed. Funding will be requested to conduct an EA of and to implement measures to improve the hydraulic capacity.

28. SOUTH SPILLWAY AREA (Plates 5 and 6)

Use of Area. This area lies south of the spillway channel between Parker Road and Chambers Road. It is included in Aurora's lease and is primarily an open space area. This area has a land classification of Multiple Resource Management: Recreation - Low Density because it forms a buffer between the spillway channel and residential areas adjacent to project lands.

Description of Area. Access drives lead south from East Hampden Avenue. The area north of East Hampden Avenue is fenced on the west, south, and east and is bounded on the north by the spillway berm and channel. Except for a lift station and a maintenance compound located south of East Hampden Avenue, east of Parker Road, and west of Meadow Hills Golf Course, the area remains as open space and has no developed facilities.

Development Needs. The DPOR desires to construct a hiking/bicycle trail in this area, parallel to the south side of the spillway, to

connect the Cherry Creek SRA trail system with Aurora's bicycle trail in Olympic Park. A trail is consistent with the use of the area for low-density recreation, but careful planning and design work are needed to ensure that the trail does not adversely impact the spillway channel. The toe of the spillway berm is the recommended location for this trail. Although a trail on top of the berm would offer a more scenic view, it would encourage trail users to enter the spillway channel east of Parker Road. Hiking in the spillway channel would exacerbate erosion on the side slopes, might result in vandalism, would increase maintenance costs, and would disturb wildlife. The recommended access to the trail is by a gate which could be installed in the fence east of Parker Road in the vicinity of the East Hampden Avenue intersection, where a traffic light is located. An alternative proposal--construction of the trail along the upstream channel of the spillway, under the Parker Road bridge, and then over the spillway berm--is not favored because it would encourage visitors to hike in the spillway channel east of Parker Road.

29. AIR FORCE COMMUNICATION TOWER (Plates 5 and 6)

Use of Area. This area is located south of the spillway channel on land which is included in Aurora's lease. It is under permit to the Department of the Air Force until May 1995 for a communication tower and access road. This area has a land classification of Project Operations because the area is used by a Federal department and there are no facilities for public use on the site.

Description of Area. This 8-acre parcel is accessed from East Hampden Avenue by a gravel road along the southern boundary of the spillway area. A gate permits access to the gravel road by authorized personnel. A communication tower is the only structure on the site.

Development Needs. No development needs have been identified for this area. If and when the Air Force ceases to use the communication tower and does not renew the permit, the City of Aurora would assume management of the area. Under Aurora's management, it is expected that

this area would be managed for low-density recreation, similar to the south spillway area which borders this area on the west, north, and east.

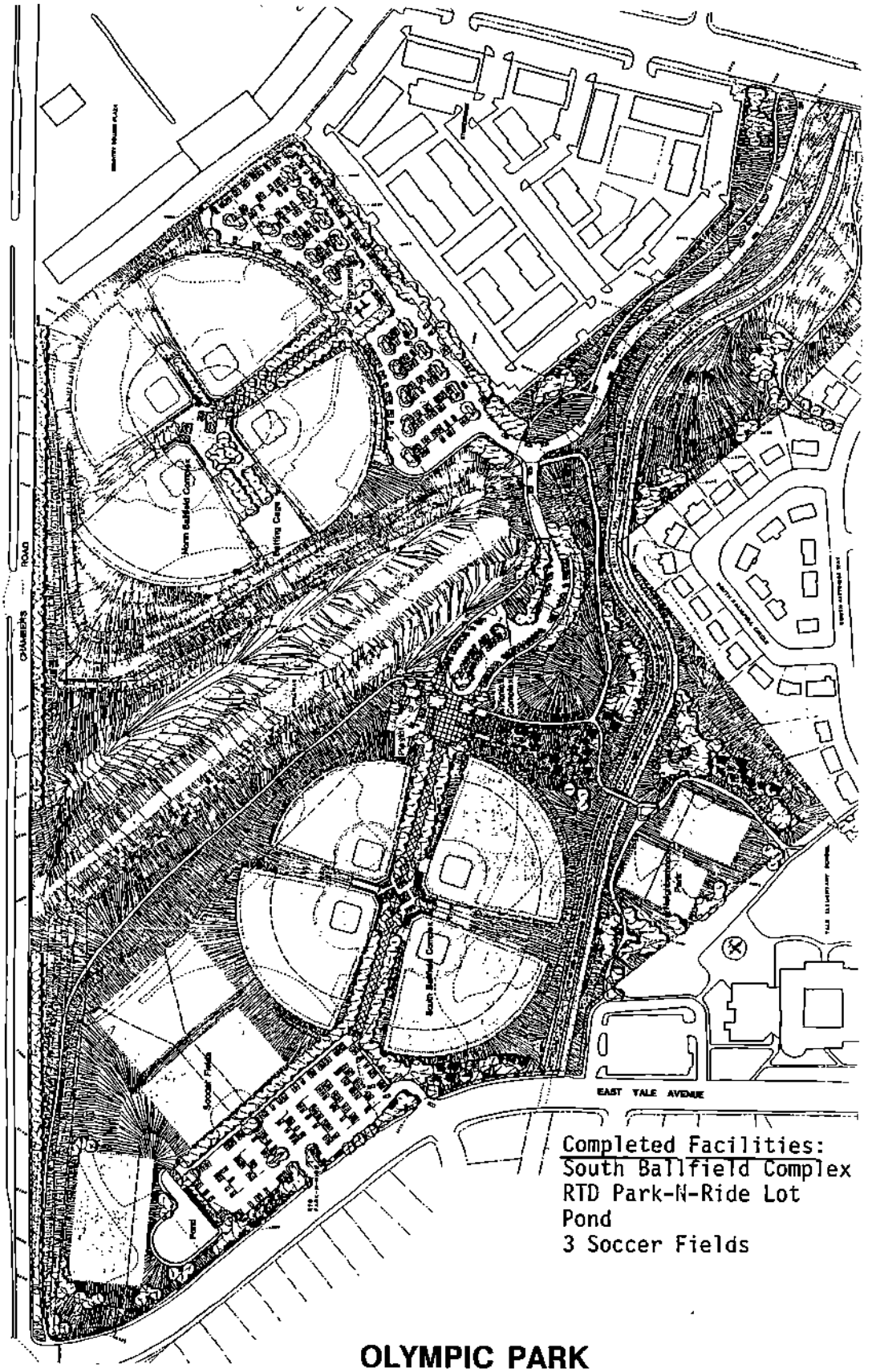
30. OLYMPIC PARK (Plate 5)

Use of Area. This area is included in Aurora's lease and is a major portion of Olympic Park, which also contains off-project lands along Toll Gate Creek, downstream from the spillway channel. Most visitors to the site use the softball complex, which is operated by a concessionaire under terms of a third-party agreement. The parking lot is used during the week for a RTD Park-and-Ride Lot. This area has a land classification of Recreation because of high visitation and extensive development as a city park.

Description of Area. Olympic Park is located east of Chambers Road, at the downstream end of the spillway. It is accessed from East Yale Avenue, which runs along the southern boundary of the park. Facilities include a lighted ballfield complex with four fields, fencing, an irrigation system, bleachers, a food concession/toilet building with indoor dining area, a large parking area, and potable water. A small manmade lake adjacent to a pavilion with seating and six youth-size soccer fields were constructed in 1989. The soccer fields were put into use in the spring of 1990. Conveyance of stormwater to Toll Gate Creek has been improved by construction of the Meadowood Channel, which traverses the site east of the ballfield complex. None of this development has been cost-shared with the Corps. This existing development and proposed future development is shown in figure 6-4.

Development Needs. The following development has been identified as needed and is expected to occur within 5 years:

- Construction of a parking lot with entry drive from East Iliff Avenue;



OLYMPIC PARK

FIGURE 6-4

- Installation of hiking/bicycle trails;

- Development of additional soccer fields south of the spillway;

- Construction of a picnicking area with plaza, picnic shelters, and play lot south of the spillway;

- Development of a ballfield complex north of the spillway with four fields, lighting, fencing, bleachers, an irrigation system, potable water, batting cage, and food concession building with toilets and indoor dining area;

- Installation of a playground north of the spillway;

- Construction of a large parking lot north of the spillway; and

- Landscaping.

Any future development and use in the spillway exit and in the portion of the spillway channel located in Olympic Park will be in accordance with the restrictions discussed in the Spillway Function section of chapter II.

31. CRESTRIDGE PARK (Plate 5)

Use of Area. This area, which is included in Aurora's lease, is used mainly for its tennis courts and playground. It is located north of the spillway channel and west of Olympic Park. This area has a land classification of Recreation because of high visitation and its development as a city park.

Description of Area. Crestridge Park is accessed from East Yale Avenue, which forms the southern and western boundaries of the park. A residential area and school lie north of this area, off-project lands. Chambers Road separates Crestridge Park from Olympic Park. The area

contains tennis courts and a playground and was recently landscaped. None of these facilities have been cost-shared with the Corps. The park facilities are shown in figure 6-5.

Development Needs. The only development identified as needed for this area within 5 years is additional landscaping.

32. NORTH SPILLWAY AREA (Plates 5 and 6)

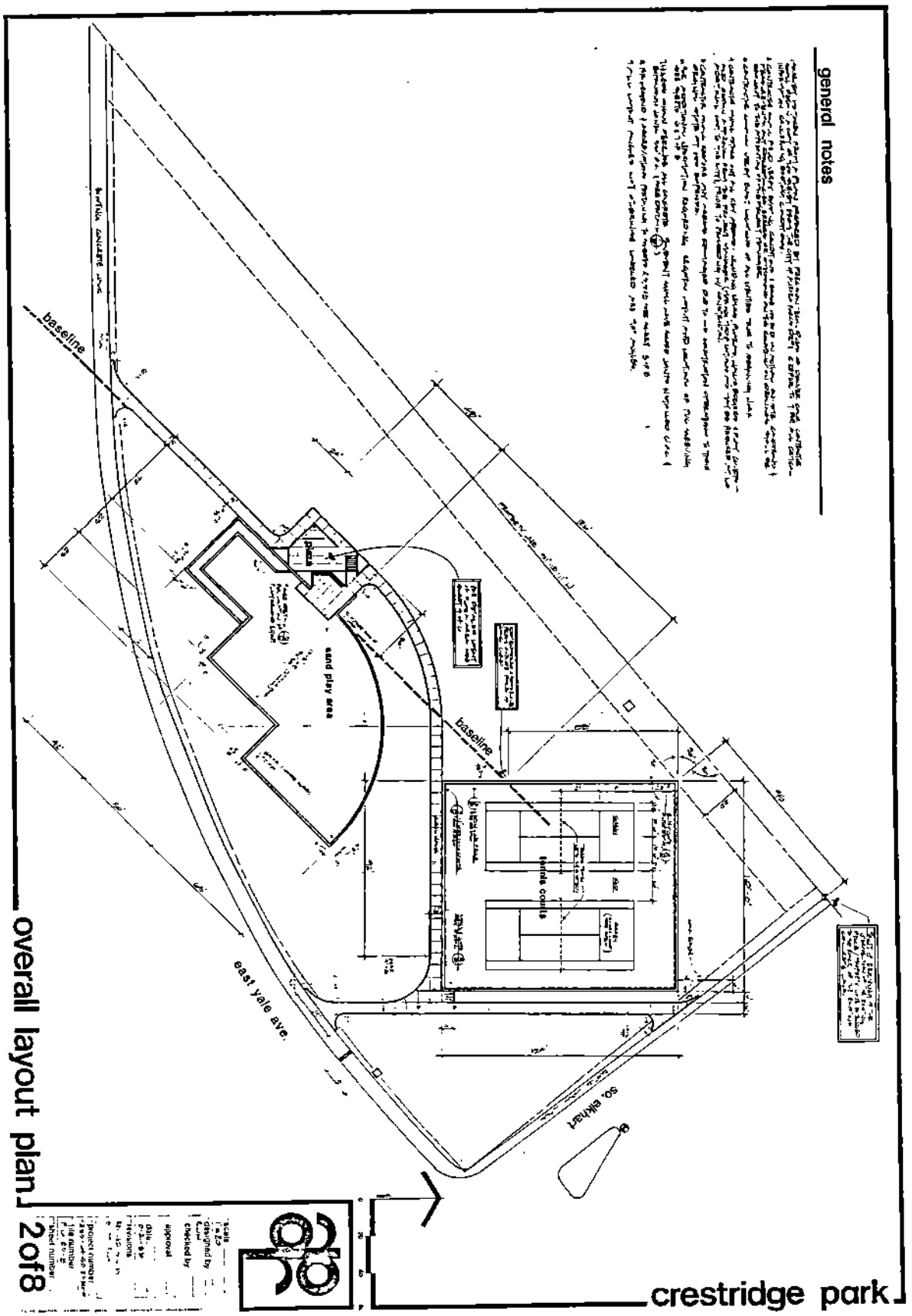
Use of Area. This area, which is included in Aurora's lease, is used mainly as a low-density recreation area. It is located north of the spillway channel and southwest of Crestridge Park. The City of Aurora has designated this area as a "Wildlife Area" because of the diversity of flora and fauna. Opportunities for nontrail hiking and nature observation are good. This area has a land classification of Multiple Resource Management: Recreation - Low Density because of low visitation, lack of developed facilities, and nature of use.

Description of Area. The north spillway area can be accessed only on foot. The area is bounded by the spillway on the south and is fenced on the west, north, and east. Entry is possible only from the east, where a stile in the fence is located. The woodlands, shrublands, and prairie vegetation found onsite constitute good wildlife habitat. The City of Aurora has not developed any recreation facilities here because too much disturbance from visitors would decrease the value of the area for wildlife.

Development Needs. The City of Aurora does not desire any development at this site because it does not want to encourage additional visitation.

33. COLORADO STATE HIGHWAY MAINTENANCE COMPOUND (Plates 5 and 6)

Use of Area. This area is leased to the Colorado State Highway Department for a maintenance patrol station which is responsible for maintenance on I-225 and Parker Road. The Colorado State Highway Patrol also shares space in this compound. This area has a land classification



VI-35

FIGURE 6-5

of Project Operations because it is used for maintaining access roads to the project. The segments of I-225 and Parker Road located on project lands and the 0.2-acre RTD Park-and-Ride site located near the I-225 interchange with Parker Road also have a land classification of Project Operations.

Description of Area. This 4.6-acre site is completely fenced and contains office space, parking areas, and buildings for storing vehicles, equipment, and supplies.

Development Needs. No development needs have been identified for this area.

34. DIXON GROVE (Plate 6)

Use of Area. This area of the Cherry Creek SRA is located north of the swim beach complex, between the east shore of the lake and the road leading to Tower Loop. It is often used by large organized youth groups, such as Scouts, day camps, and day-care centers, for picnicking and other day use activities, and portions of the area are available for group reservations. The jetty is a popular spot for shoreline and ice fishing. This area has a land use classification of Recreation because of high visitation and extensive development.

Description of Area. Access is by the paved road leading to Tower Loop or by bicycle trail. Two parking lots, at the north and south ends of the area, and the connector road between them were resurfaced in 1989. There is a grove of mature cottonwood trees, with picnic sites scattered under the trees. The DPOR, in cooperation with the Colorado State Forest Service, recently planted honeylocust and ash trees among the cottonwoods so that the picnic area will remain shady when the cottonwoods die. The native grass ground cover has become sparse, partially due to heavy foot traffic. Potable water is available. There

are two vault toilets, one of which is handicapped-accessible. Handicapped-accessible fishing pods were constructed on the jetty in 1989.

Development Needs. The following development has been identified as needed and is expected to occur within 5 years:

- Installation of shoreline erosion protection,
- Construction of a flush comfort station with space heating, and
- Installation of turf and a sprinkler system.

35. TOWER LOOP (Plate 6)

Use of Area. This area is one of the most popular areas for shoreline and ice fishing in the Cherry Creek SRA. It is located east of the intake tower, between Dixon Grove and the dam. This area has a land classification of Recreation because of high visitation and extensive development.

Description of Area. Access to the area is provided by a paved road which ends in a parking loop. Fishing takes place from the riprapped shoreline. Other facilities are picnic sites, potable water, and a vault toilet.

Development Needs. The following development was identified as needed and is expected to occur within 5 years:

- Construction of a flush comfort station with a fish-cleaning area,
- Installation of shoreline erosion protection,

- Resurfacing of the access road and parking areas, and

- Installation of shade shelters and additional picnic facilities.

36. CORPS OF ENGINEERS MAINTENANCE RESIDENCE (Plates 5 and 6)

Use of Area. This area of the Cherry Creek SRA is located south of the dam and west of Parker Road. A house is used as a residence for a Corps civil engineering technician. A portion of the house serves as an operational facility. Radio communications, receiving center for stream gage data via telecommunications, and storage of maintenance equipment are all functions of this facility. Maintenance activities on the dam and outlet works are conducted from this area. This area has a land classification of Project Operations because the facilities located here are used for operating and maintaining the project.

Description of Area. The residence, some storage buildings, and a weather station are in a fenced yard which has a separate entrance from Parker Road. Several storage buildings are located outside the fenced compound. A vehicle trail leads from the compound along the upstream face of the dam.

Development Needs. In accordance with the Omaha District's Housing Management Plan, dated 2 September 1982 and prepared in compliance with ER 1130-2-425 (Project Operation - Civil Works Housing), it is anticipated that the house will be used only for operations and maintenance purposes and not as a residence by 1996.

37. DAM EMBANKMENT, INTAKE TOWER, AND OUTLET WORKS (Plates 6 and 7)

Use of Area. These structures function to retain and release reservoir waters. There is also some recreation use of the dam embankment. Shoreline fishing is popular along the riprapped face of the dam. For the benefit of sightseers, the road along the crest of the dam has overlook parking on both sides of the road at a point near the

intake tower and outlet works. This area has a land classification of Project Operations because these structures are essential to the functioning of the project for flood control.

Description of Area. The dam is comprised of rolled earth and is 14,300 feet long. The dam crest road is accessed from Yosemite Street or Dayton Street on the west or Parker Road on the east. It is paved and provides for one lane of traffic in each direction. Maintenance access to the outlet works is provided by the downstream toe access road, a one-lane dirt road which extends from Parker Road to the east side of the outlet works. Another access is provided by a dirt vehicle trail which extends from a gate in the fence on the south side of I-225 near the old Kenwood Dam outlet works to the east side of the outlet works; it utilizes a narrow maintenance roadbed between the outlet works and the embankment. In 1987, the DPOR constructed a concrete bicycle trail segment north of the dam and east of the outlet works to connect the bicycle trail along Parker Road with Denver's trail on the J.F. Kennedy Golf Course. This trail segment runs under the I-225 bridge.

Development Needs. The DPOR desires to construct another bicycle trail segment to connect the trail east of the outlet works with the bicycle trail in Village Greens Park, west of the dam. If such a trail segment is constructed, it is recommended that the DPOR construct a long footbridge, subject to hydraulic considerations, across the outlet channel downstream from the outlet works to accommodate the trail crossing. Use of the maintenance roadbed between the embankment and the outlet works for the trail crossing is not advisable because the heavy Corps maintenance equipment would damage the trail. Care should be provided to avoid interfering with Corps instrumentation in the area.

38. J.F. KENNEDY BALLFIELD COMPLEX (Plates 6 and 7)

Use of Area. This downstream area is part of Denver's long-term lease. Most of the visitation focuses on the softball fields. This

area has a land classification of Recreation because of high visitation and extensive development as a city park.

Description of Area. The ballfield complex contains approximately 74.15 acres and is accessed by off-project roads. An improved dirt road provides access within the site. Facilities include four softball fields, a food concession building with flush toilets, a hiking/bicycle trail, a large parking area, and potable water. Development of two additional softball fields with multipurpose fields in the outfields began in late fall 1989. None of the facilities were cost-shared with the Corps. A development plan, design concept 1, for existing and proposed facilities is presented as figure 6-6.

Development Needs. The following development has been identified as needed and is expected to occur within 5 years:

- Development of two additional softball fields;
- Fencing, irrigation, and lighting at all four new fields;
- Installation of a hiking/bicycle trail;
- Construction of batting cages;
- Expansion and paving of the parking lot;
- Construction of an additional food concession building with toilet;
- Development of picnic sites;
- Installation of a playground; and
- Landscaping.

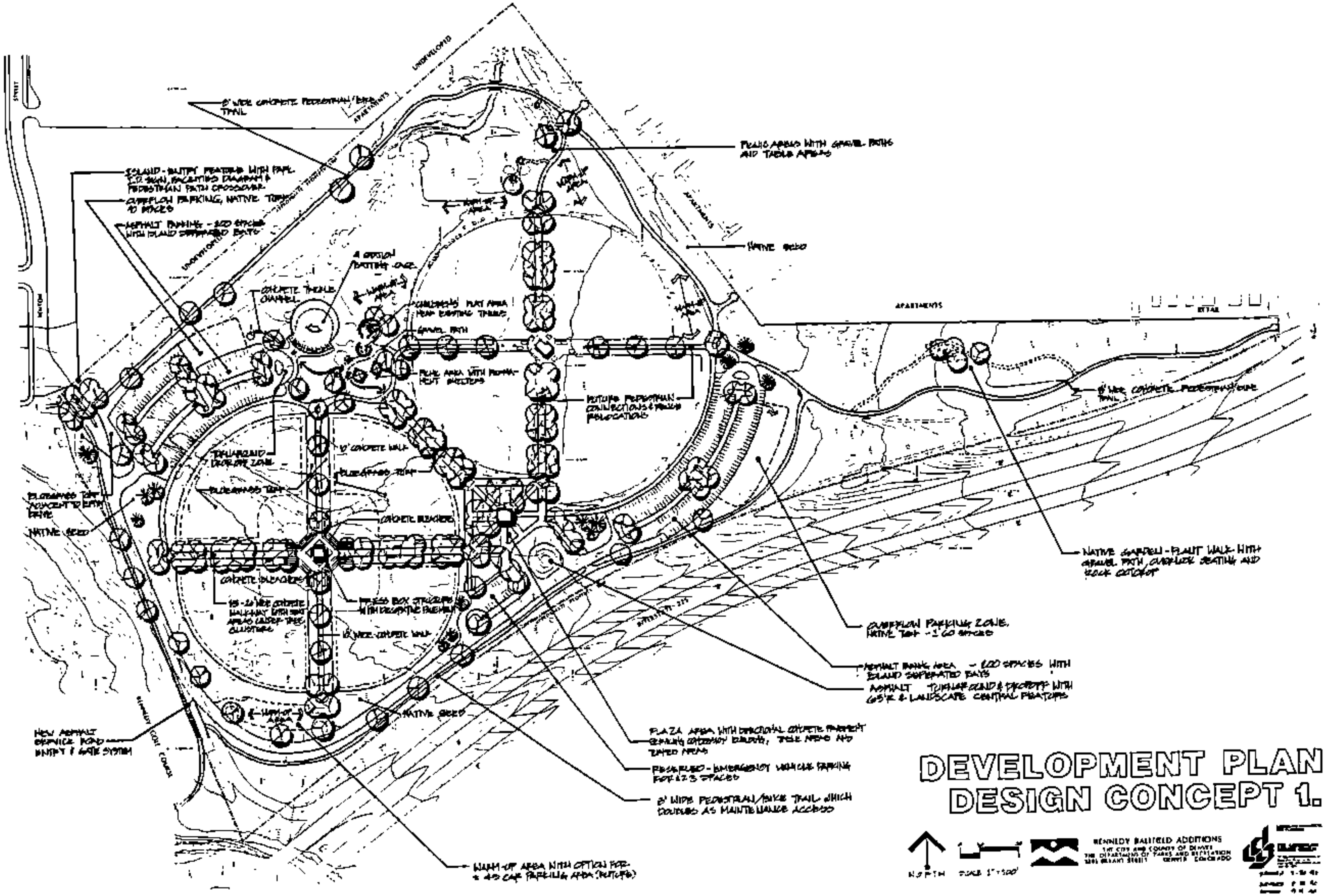

DEVELOPMENT PLAN
DESIGN CONCEPT 1.
8' WIDE CONCRETE PEDESTRIAN/BIKE TRAIL
PICNIC AREAS WITH GRAVEL PATHS AND TABLE AREAS
OVERFLOW PARKING, NATIVE TURF 70 SPACES
NATIVE SEED
APARTMENTS
NATIVE GARDEN-PLANT WALK WITH GRAVEL PATH, OVERLOOK SEATING AND ROCK OUTCROP
OVERFLOW PARKING ZONE, NATIVE TURF - 160 SPACES
RESERVED - EMERGENCY VEHICLE PARKING FOR 2-3 SPACES
8' WIDE PEDESTRIAN/BIKE TRAIL WHICH DOUBLES AS MAINTENANCE ACCESS
NEW ASPHALT SERVICE ROAD ENTRY & GATE SYSTEM
NATIVE SEED
KENNEDY BALLFIELD ADDITIONS
NORTH

FIGURE 6-6

COST-SHARED DEVELOPMENT AND COST ESTIMATES

Contract DACW-45-74-C-0030 between the United States of America and the State of Colorado for Recreation and Fish and Wildlife Development, Cherry Creek Lake, Colorado, was executed 5 June 1974. All facilities listed in the Estimated Separable Recreation Costs, exhibit B of the contract, are eligible for cost-sharing if they are considered as new facilities rather than replacements. In 1973, initial development cost was estimated to be $2,216,200. Over $966,000 in recreation development costs were shared by the Government and the DPOR from 1984 through April 1991. Continued Corps cost-sharing for facilities listed in exhibit B of the contract and not yet developed at the Cherry Creek SRA is contingent upon future availability of funds.

CHAPTER VII

CONCLUSIONS

The Cherry Creek Lake project, although constructed primarily for flood control, is very important for recreation because it offers a great diversity of outdoor recreation opportunities and wildlife habitat close to home for residents of the Denver metropolitan area.

Non-Federal entities, who manage most of the Cherry Creek Lake project under lease with the Corps, have done an excellent job of promoting and maintaining this diversity. The DPOR-managed area, known as the Cherry Creek SRA, has facilities to support resource-based intensive recreation on the east and west shores of the lake and to support low-density recreation in the large open space areas upstream from the lake. Urban park facilities have been developed in areas managed by the City and County of Denver, the City of Aurora, and the City of Greenwood Village; these areas are separated from the SRA by the dam, spillway, or heavily traveled roadways.

Although the Cherry Creek Lake project is relatively small in size, it is the fifth highest in visitation among the Corps' Omaha District reservoirs. The Cherry Creek SRA is second highest in visitation among the State Parks in Colorado. Overcrowding had become a problem at the Cherry Creek SRA by the early 1980's. The DPOR's implementation of carrying capacity controls has eliminated overcrowding while permitting SRA visitation to grow through increased weekday use.

The Cherry Creek Lake project's large open areas are important to wildlife, enhance the quality of intensive recreation experiences, and provide opportunities for low-density recreation. An important policy

of this Master Plan is that a significant portion of project lands upstream from the dam should be preserved as open space and buffer for low-density recreation and wildlife uses. This would include approximately 60 percent of the Cherry Creek SRA and a majority of the spillway area. This policy is consistent with the plans of the DPOR and Aurora for these areas. Another important policy is that development of urban park facilities should be limited to areas physically separated from the SRA by the dam, spillway, or heavily traveled roads.

Problems such as soil erosion, sediment deposition, and decline in water quality have occurred as the area upstream from Cherry Creek Dam has urbanized. Although reservoirs are constructed with the expectation that they will eventually fill in with sediment, preserving the viability of Cherry Creek Lake for fisheries and water-based recreation is important to State and local interests. The CCBWQA is working to improve water quality and extend the life of the lake in cooperation with the Corps, State agencies, and local interests.

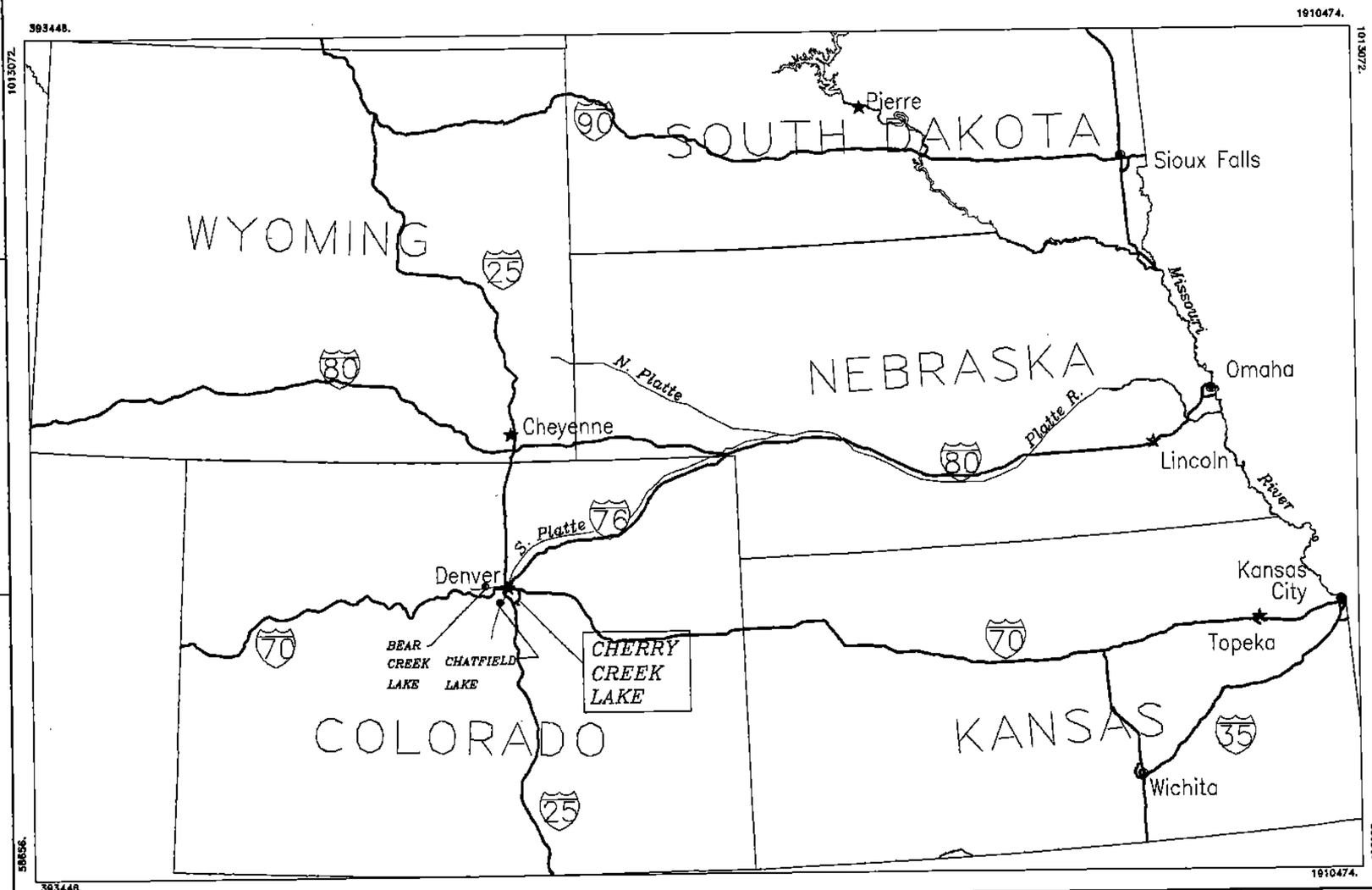
Water-rights administration could potentially cause a progressive decline in the lake level of approximately 2 feet per year. The State is currently investigating potential solutions to the problem of maintaining relatively stable lake levels.

CHAPTER VIII

RECOMMENDATIONS

It is recommended that this updated Master Plan be approved as Corps of Engineers policy for management of the Cherry Creek Lake, Colorado, project. The development plans and policies included in this Master Plan will optimize project benefits and minimize adverse impacts. The plans and policies are consistent with authorized project purposes and resource capabilities; accommodate Federal, State, and local needs; represent wise stewardship of resources; will lengthen the life of the lake; and will result in increased enjoyment of outdoor recreation activities.

It is further recommended that the Corps of Engineers continue cooperating with State and local interests in efforts to improve the natural and manmade resources at Cherry Creek Lake, so that the project can remain a focus of land-based and water-based outdoor recreation activities in the Denver area for future generations.



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SCALE IN MILES

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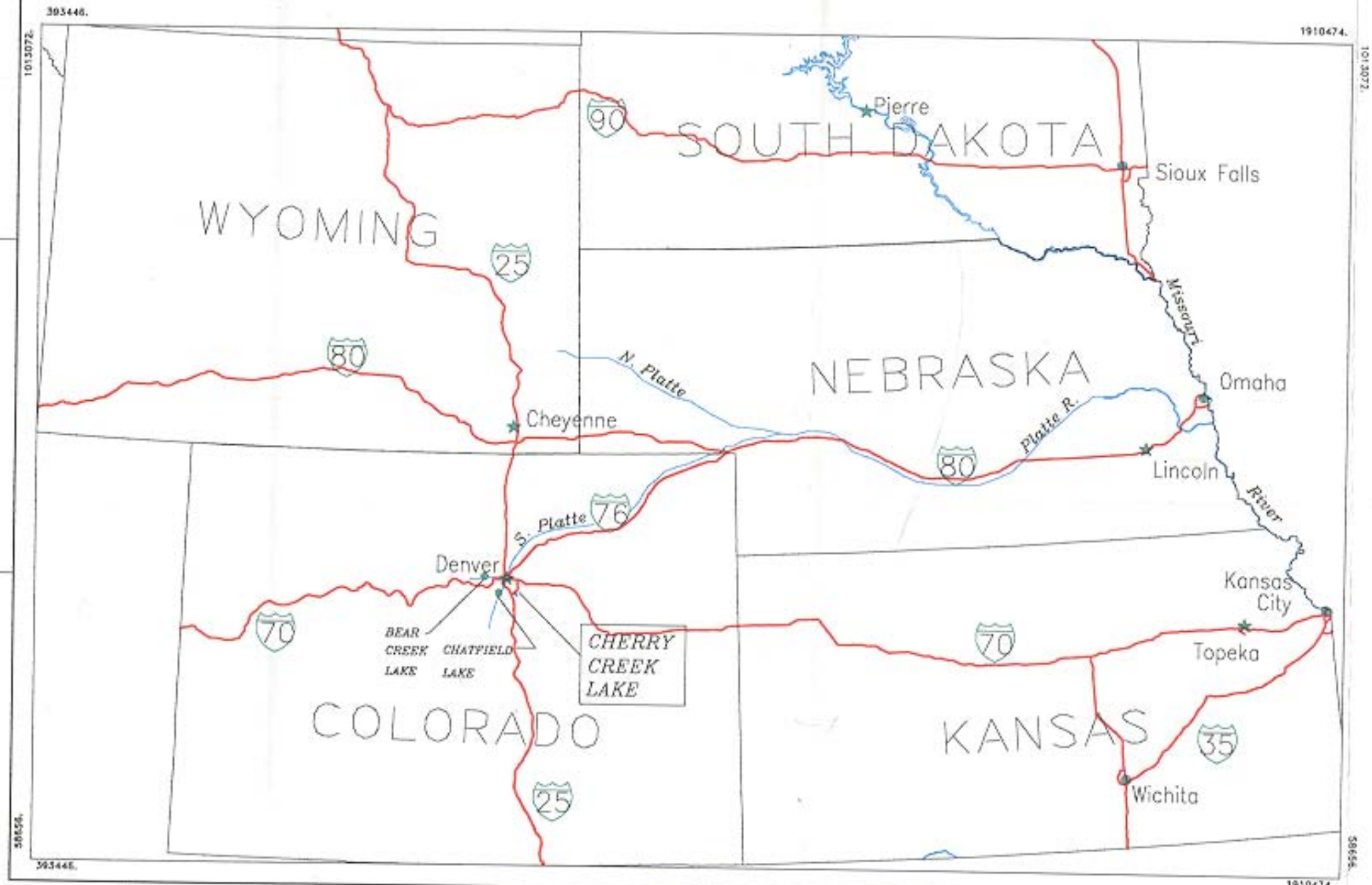
Revisions			
Symbol	Descriptions	Date	Approved

OMAHA DISTRICT
GEOGRAPHIC INFORMATION SYSTEMS
ENGINEERING DIVISION

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

Designed by: CEMRO-ED-GIS	CHERRY CREEK	COLORADO
Drawn by: Tim Bourke	CHERRY CREEK LAKE MASTER PLAN PROJECT LOCATION	
Checked by: Bill Battenberg	PLATE 1	
Reviewed by: Elizabeth Peaks	Scale: As Shown	Date: 20-JAN-1992
Submitted by: RICHARD P. MINER PLANNING DIVISION	Design Memorandum No. CC-14	Drawing code: REGION-1
	Contract No.: DACW	Sheet reference number: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Pierre
Sioux Falls
Omaha
Cheyenne
Lincoln
Denver
Kansas City
Topeka
Wichita
Missouri River
N. Platte
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S. Platte
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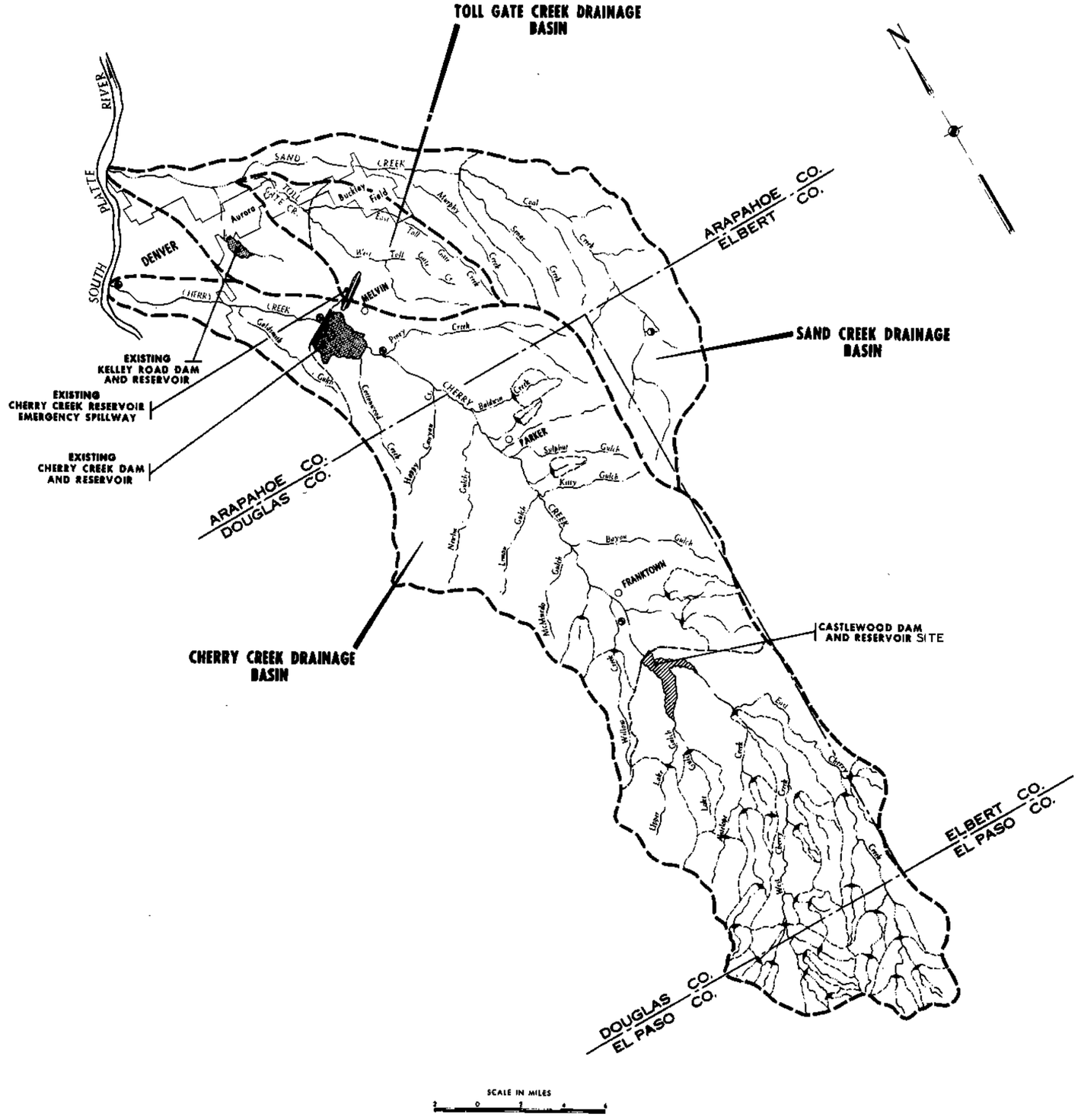

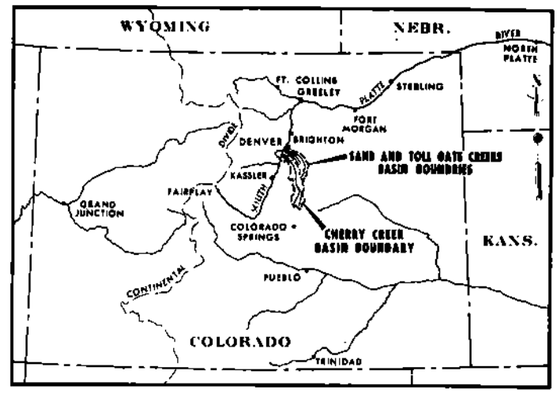

LOCATION MAP

LEGEND:

- DRAINAGE AREA BOUNDARIES
- EXISTING CORPS OF ENGINEERS PROJECTS
- PROPOSED CORPS OF ENGINEERS PROJECT
- EXISTING SOIL CONSERVATION SERVICE PROJECTS
- U.S.G.S. GAGING STATION
- WEATHER BUREAU PRECIPITATION AND TEMPERATURE STATION

U.S.ARMY CORPS OF ENGINEERS

THIS DRAWING HAS BEEN REDUCED TO THREE-EIGHTHS THE ORIGINAL SCALE.

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OMAHA, NEBRASKA

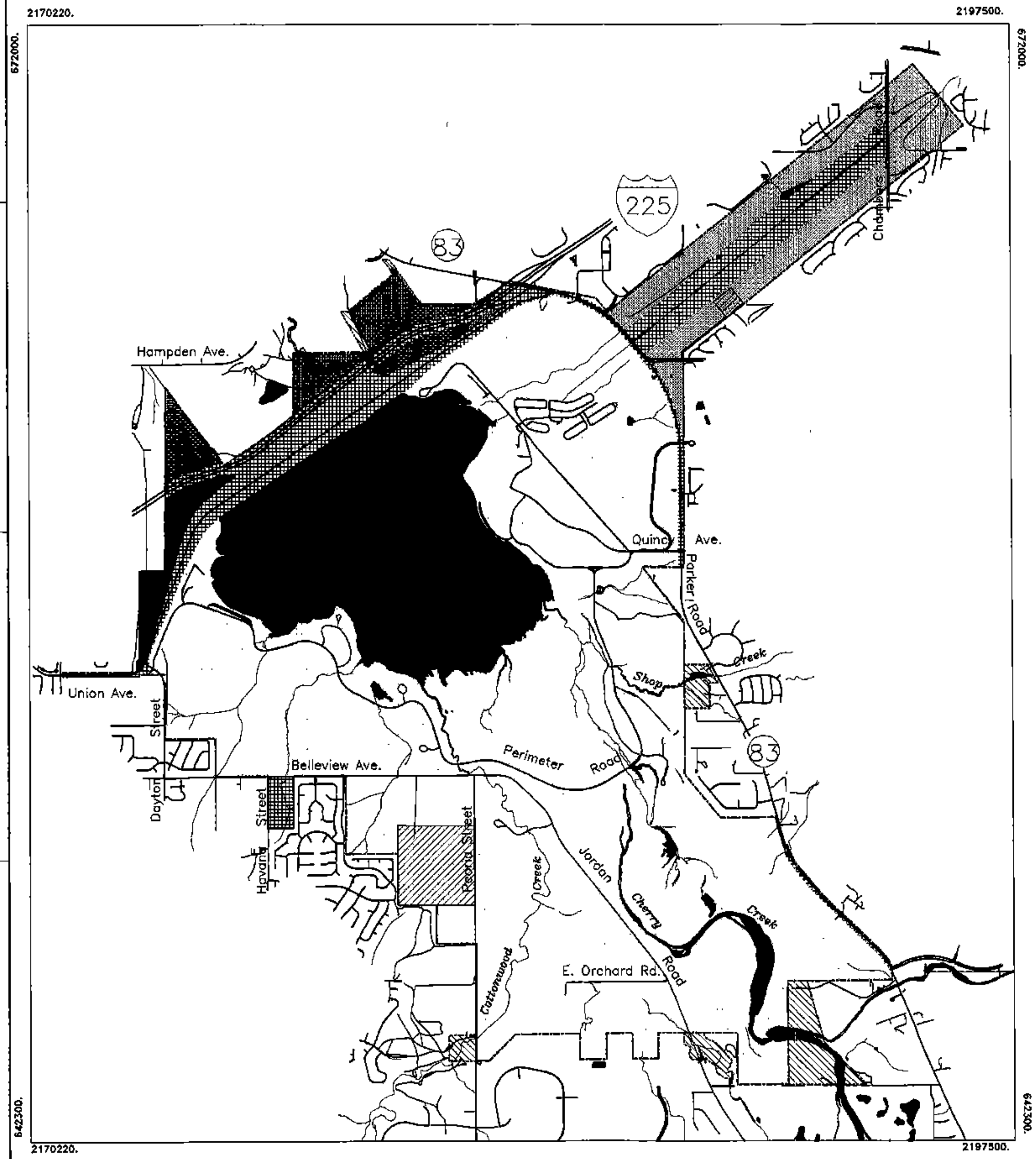
Designed by: CENRO-ED-GIS
Drawn by:
Checked by:
Reviewed by: Elizabeth Pecke
Submitted by: RICHARD P. MINER PLANNING DIVISION

CHERRY CREEK COLORADO

CHERRY CREEK LAKE MASTER PLAN BASIN AND LOCATION MAP

PLATE 2

Scale: As Shown
Design Memorandum DM CC-14
Contract No.: DACW
Sheet reference number:
Date: 21-OCT-1991
Drawing code:



MAP LEGEND

- CORPS OF ENGINEERS
- CITY OF AURORA
- CITY OF DENVER
- GREENWOOD VILLAGE
- COLORADO DPOR
- PERMITS
- PERMANENT EASEMENTS
- WATER BODIES, STREAMS
- PROJECT BOUNDARY
- TRANSPORTATION

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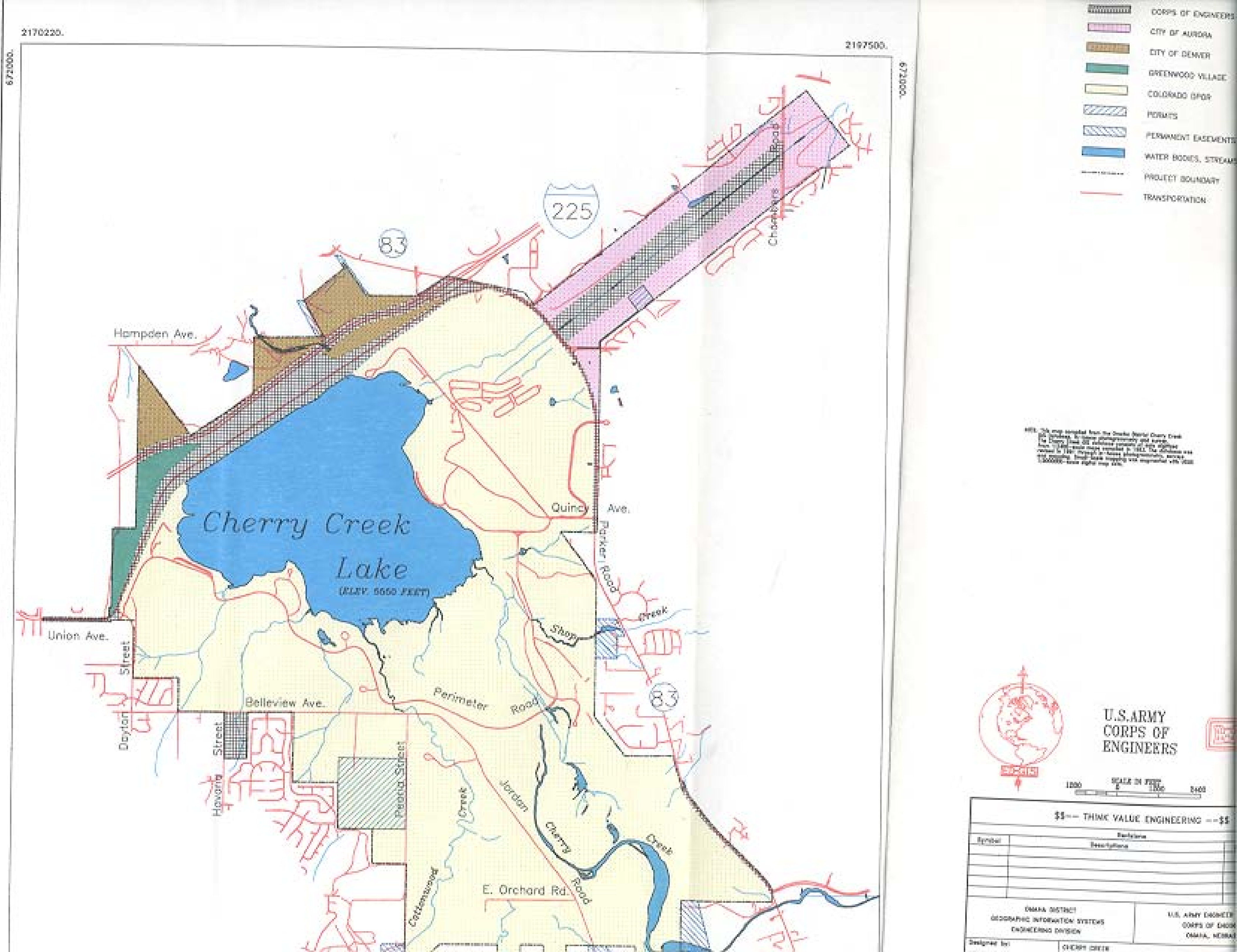
OMAHA, NEBRASKA

CHERRY CREEK — COLORADO

CHERRY CREEK LAKE MASTER PLAN LEASED AREAS

PLATE 3

Designed by:	CEMRO-ED-GIS
Drawn by:	Tim Bourke
Checked by:	Bill Schwering
Reviewed by:	Elizabeth Peake
Submitted by:	RICHARD P. MINER, PLANNING DIVISION
Scale:	As Shown
Design Memorandum	DM OC-14
Contract No.:	DACW
Sheet reference number:	
Date:	20-JAN-1992
Drawing code:	LEASE-3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CORPS OF ENGINEERS
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CITY OF DENVER
GREENWOOD VILLAGE
COLORADO DPOR
PERMITS
PERMANENT EASEMENTS
WATER BODIES, STREAMS
PROJECT BOUNDARY
TRANSPORTATION
225
83
83
Hampden Ave.
Chambers Road
Cherry Creek
Lake
(ELEV. 5550 FEET)
Quincy Ave.
Parker Road
Shop Creek
Union Ave.
Dayton Street
Belleview Ave.
Perimeter Road
Havana Street
Peoria Street
Cottonwood Creek
Jordan Road
Cherry Creek
E. Orchard Rd.
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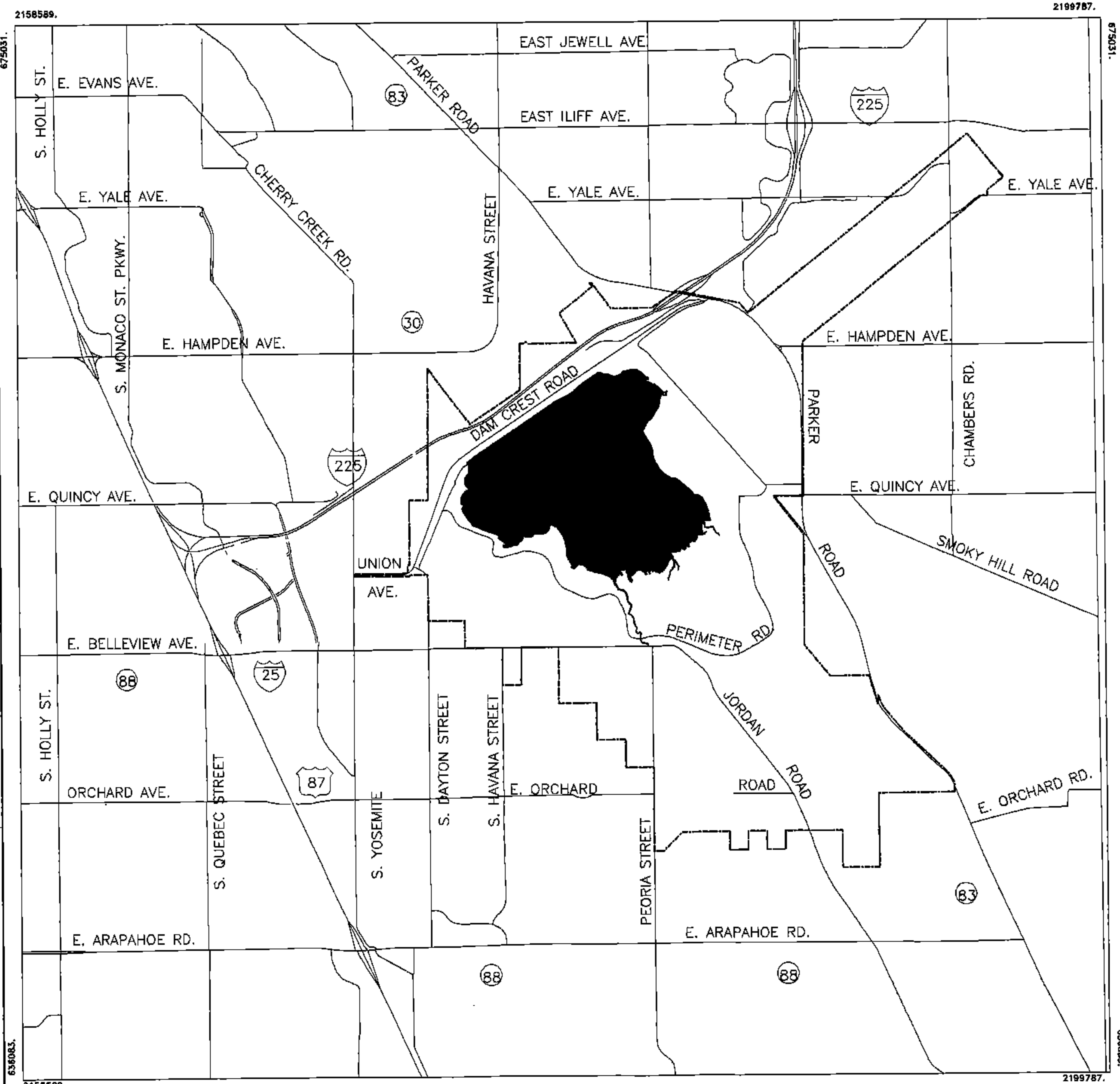

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Revisions			
Symbol	Descriptions	Date	Approved

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CHERRY CREEK — COLORADO

CHERRY CREEK LAKE
MASTER PLAN
ROAD ACCESS

PLATE 4

Designed by: CEMRO-ED-GIS	Scale: As Shown	Sheet reference number:	Date: 14-JAN-1992
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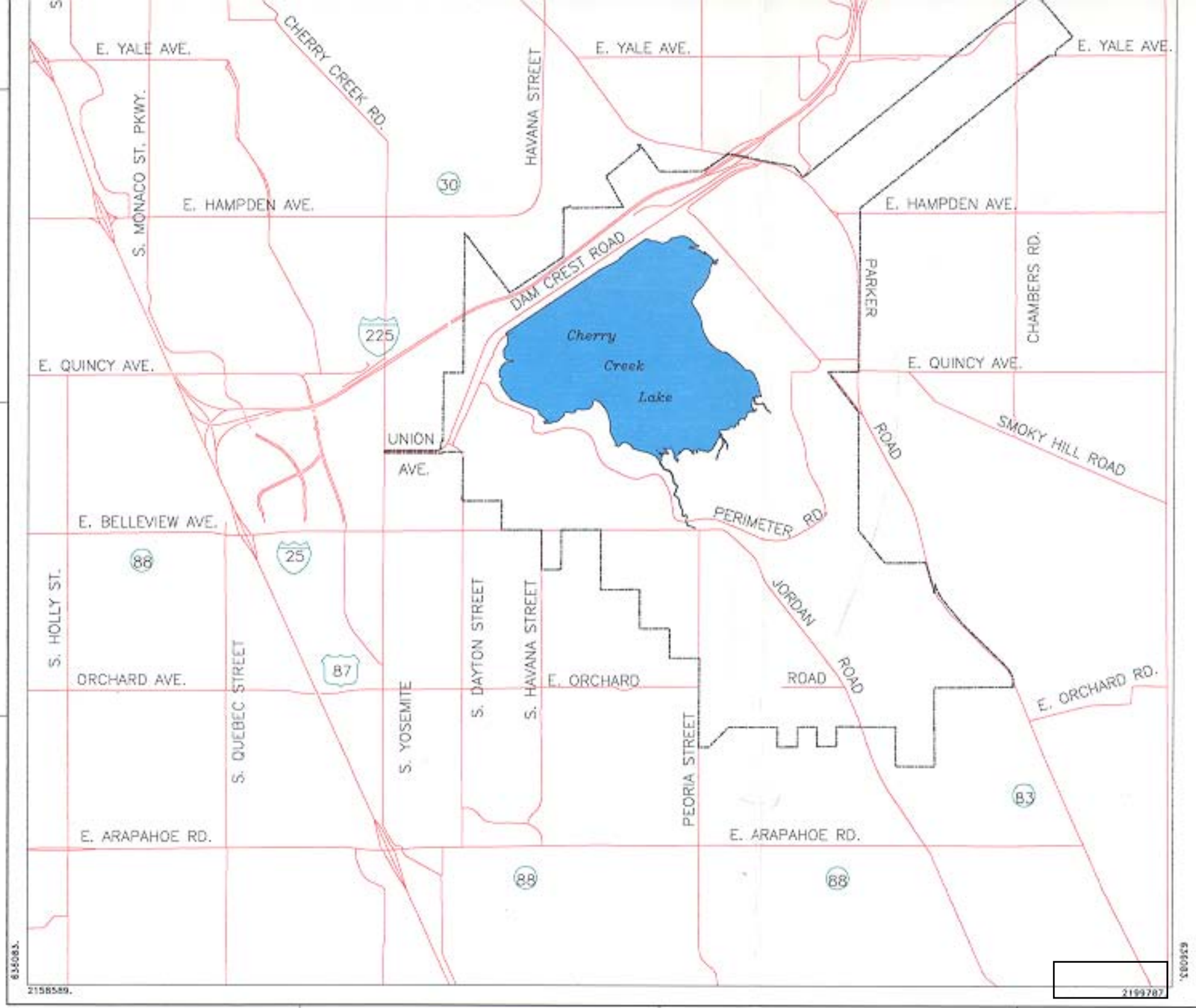
Reviewed by: Elizabeth Peake			
Submitted by: RICHARD P. MINER PLANNING DIVISION			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DAM CREST ROAD
PARKER
CHAMBERS RD.
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Creek
Lake
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E. QUINCY AVE.
UNION
AVE.
SMOKY HILL ROAD
ROAD
PERIMETER RD.
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JORDAN
ROAD
ORCHARD AVE.
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S. QUEBEC STREET
S. YOSEMITE
S. DAYTON STREET
S. HAVANA STREET
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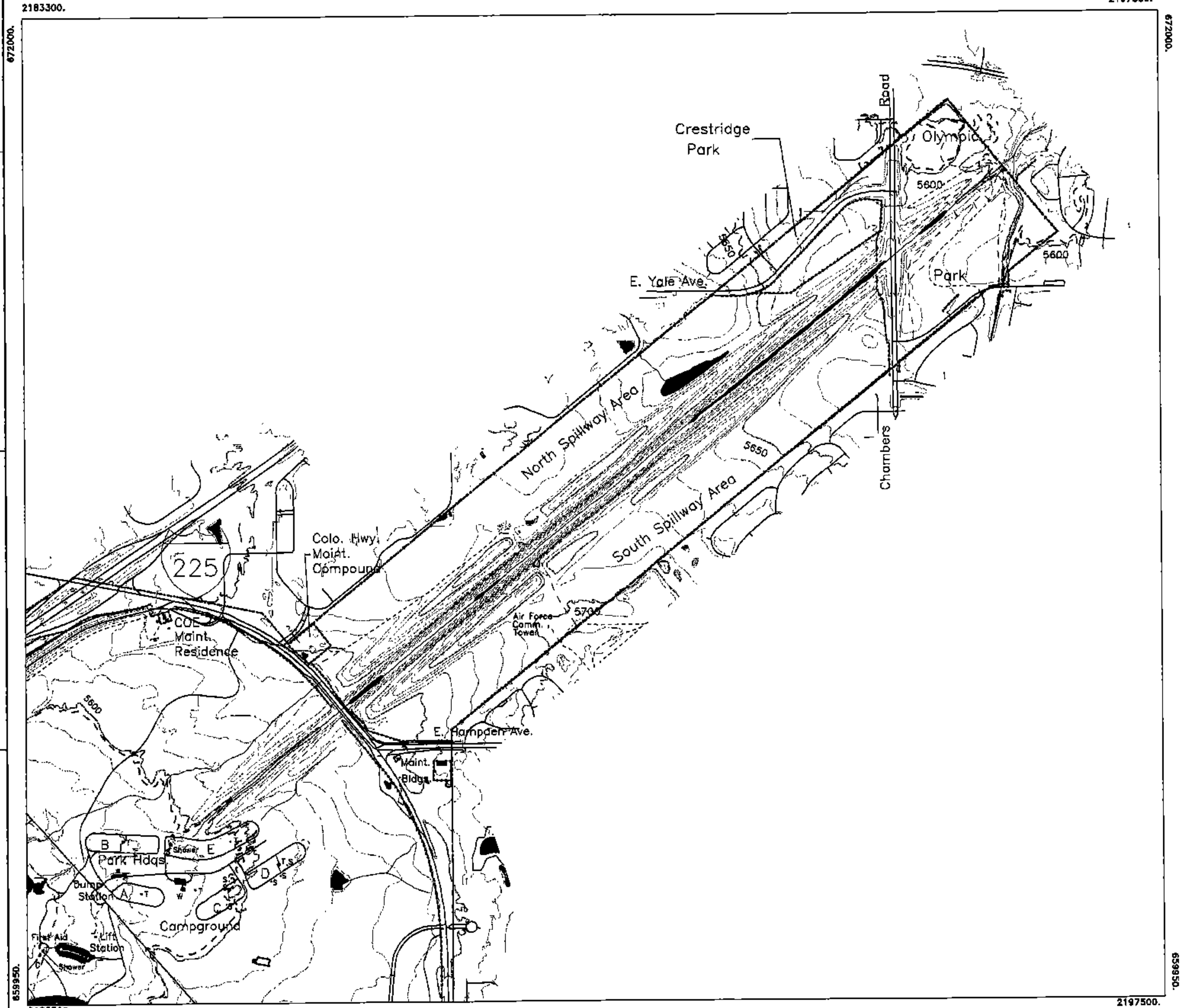
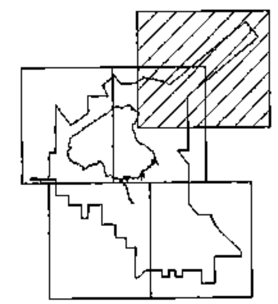


MAP LEGEND

- WATER BODIES, STREAMS
- TOP OF FLOOD CONTROL POOL 5598 FEET M. S. L.
- PERMANENT EASEMENTS
- PROJECT BOUNDARY
- FENCE
- ELEVATION CONTOUR
- ULTIMATE EROSION LIMIT
- DAM EMBANKMENT AND SPILLWAY
- PARKING
- PAVED ROAD
- GRAVEL ROAD
- BICYCLE TRAIL
- EQUESTRIAN TRAIL



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ED-GIS

SCALE IN FEET 500 0 500 1000

$$-- THINK VALUE ENGINEERING --$$

Revisions			
Symbol	Descriptions	Date	Approved

OMAHA DISTRICT
GEOGRAPHIC INFORMATION SYSTEMS
ENGINEERING DIVISION

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

Designed by: CEMRO-ED-GIS
Drawn by: Tim Rourke
Checked by: Bill Schwening
Reviewed by: Elizabeth Peake
Submitted by: RICHARD P. MINER PLANNING DIVISION

CHERRY CREEK — COLORADO

CHERRY CREEK LAKE MASTER PLAN DEVELOPMENT PLAN SHEET 1

PLATE 5

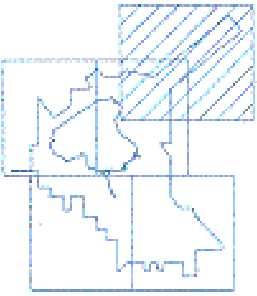
Scale: As Shown
Design Memorandum DM CC-14
Contract No.: DACW
Sheet reference number: 1 OF 5
Date: 3-FEB-1992
Drawing code: DEVEL-1

MAP LEGEND

- WATER BODIES, STREAMS
- TOP OF FLOOD CONTROL POOL 5098 FEET M. S. L.
- PERMANENT EASEMENTS
- PROJECT BOUNDARY
- FENCE
- ELEVATION CONTOUR
- ULTIMATE EROSION LIMIT
- DAM EMBANKMENT AND SPILLWAY
- PARKING
- PAVED ROAD
- GRAVEL ROAD
- BICYCLE TRAIL
- EQUESTRIAN TRAIL

D

C



B

U.S.ARMY
CORPS OF
ENGINEERS

SCALE IN FEET
500 0 500 1000

$$-- THINK VALUE ENGINEERING --$$

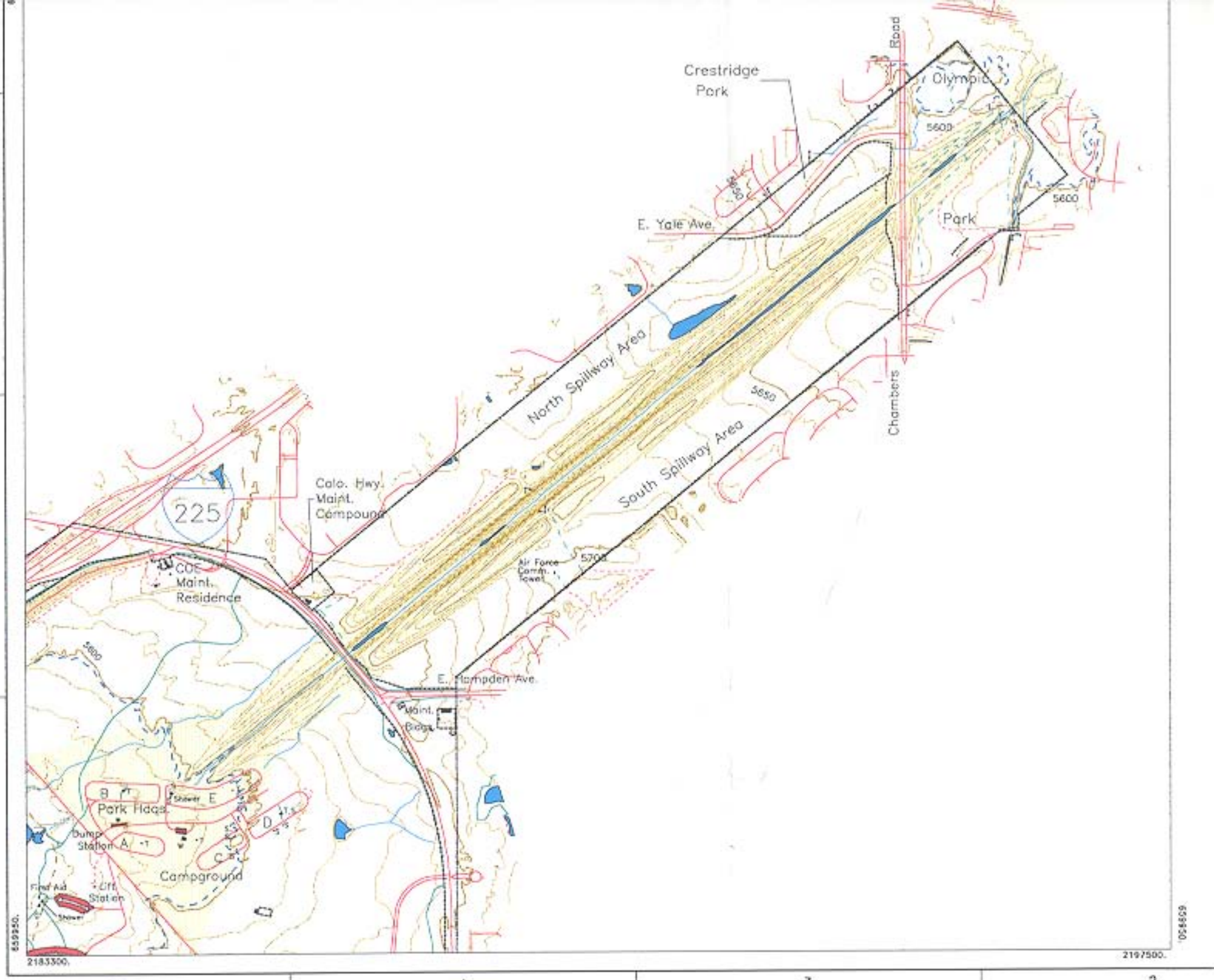
Revisions

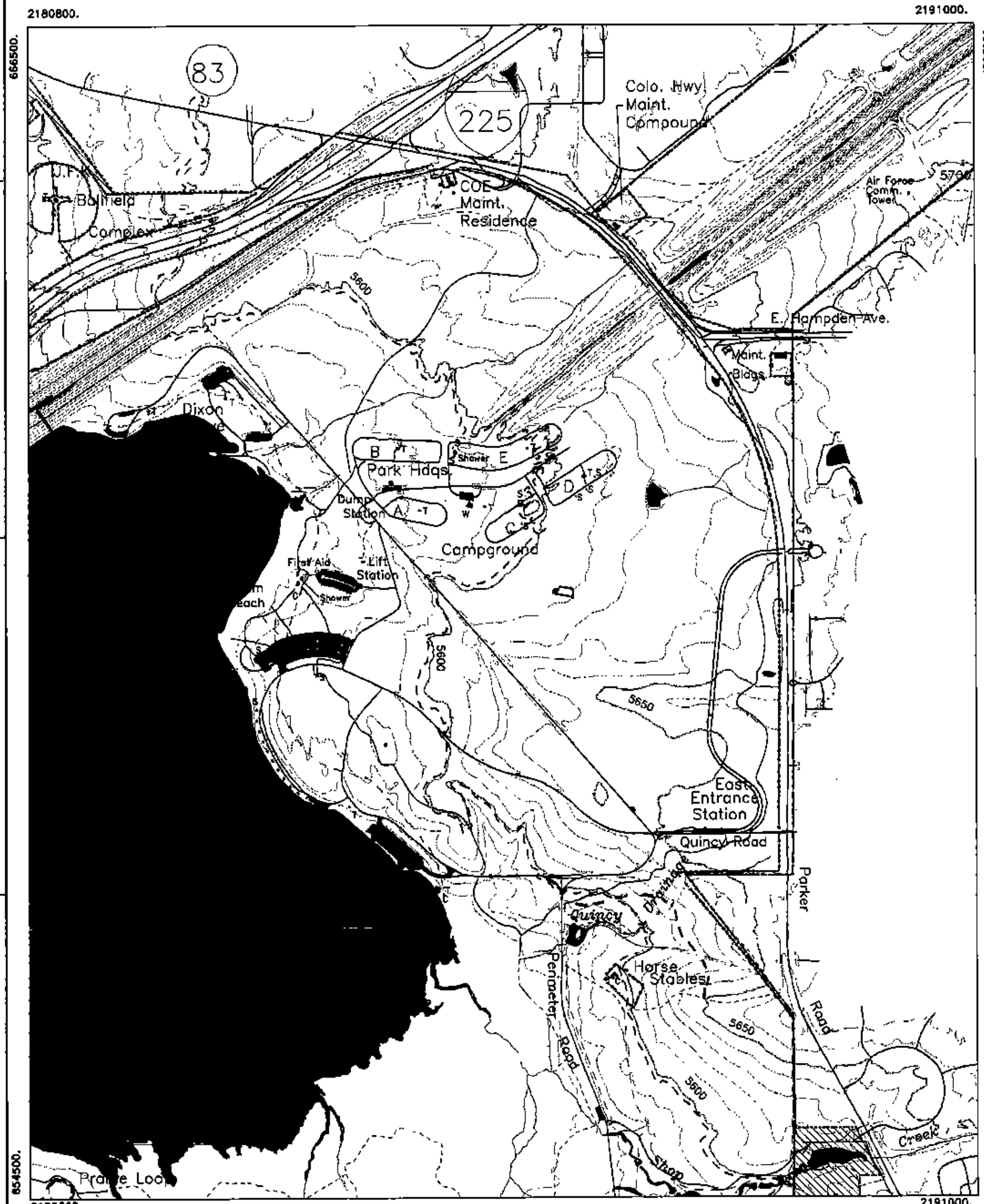
Symbol	Descriptions	Date	Approved

OMAHA DISTRICT GEOGRAPHIC INFORMATION SYSTEMS ENGINEERING DIVISION	U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA, NEBRASKA

A

Designed by: CEMRO-ED-GIS	CHERRY CREEK — COLORADO CHERRY CREEK LAKE MASTER PLAN DEVELOPMENT PLAN SHEET 1 PLATE 5		
Drawn by: Tim Rourke			
Checked by: Bill Schwening			
Reviewed by: Elizabeth Peake	Scale: As Shown	Sheet reference number:	Date: 3-FEB-1992
Submitted by: RICHARD P. MINER PLANNING DIVISION	Design Memorandum DM GC-14 Contract No.: DACW	1 OF 5	Drawing code: DEVEL-1

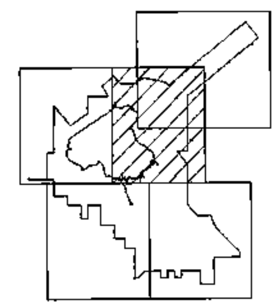

Crestridge Park
Olympia Road
5600
5650
E. Yale Ave.
Park
North Spillway Area
South Spillway Area
Chambers
225
Colo. Hwy. Maint. Compound
COE Maint. Residence
Air Force Comm. Tower
5700
E. Hampden Ave.
Maint. Bldg.
Park Hdqs.
Shower
Dump Station
Campground
Fire Aid
Lift Station
Shower
659950.
2183300.
2197500.
1054659



← Shop Ck. Pond

MAP LEGEND

- WATER BODIES, STREAMS
- TOP OF FLOOD CONTROL POOL 5598 FEET M. S. L.
- PERMANENT EASEMENTS
- PROJECT BOUNDARY
- FENCE
- ELEVATION CONTOUR
- ULTIMATE EROSION LIMIT
- DAM EMBANKMENT AND SPILLWAY
- PARKING
- PAVED ROAD
- GRAVEL ROAD
- BICYCLE TRAIL
- EQUESTRIAN TRAIL



U.S.ARMY CORPS OF ENGINEERS

ED-GIS

SCALE IN FEET
500 0 500 1000

$$-- THINK VALUE ENGINEERING --$$

Revisions

Symbol	Descriptions	Date	Approved

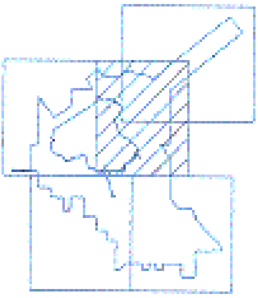
OMAHA DISTRICT
GEOGRAPHIC INFORMATION SYSTEMS
ENGINEERING DIVISION

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

Designed by: CEMRO-ED-GIS	CHERRY CREEK — CHERRY CREEK LAKE MASTER PLAN DEVELOPMENT PLAN SHEET 2 PLATE 6 — COLORADO		
Drawn by: Tim Rourke			
Checked by: Bill Schwening			
Reviewed by: Elisabeth Peake	Scale: As Shown	Sheet reference number:	Date: 3-FEB-1992
Submitted by: RICHARD P. MINER PLANNING DIVISION	Design Memorandum DM CC-14 / Control No.: DACW	2 OF 5	Drawing code: DEVEL-2

MAP LEGEND

- WATER BODIES, STREAMS
- TOP OF FLOOD CONTROL POOL 5598 FEET M. S. L.
- PERMANENT EASEMENTS
- PROJECT BOUNDARY
- FENCE
- ELEVATION CONTOUR
- ULTIMATE EROSION LIMIT
- DAM EMBANKMENT AND SPILLWAY
- PARKING
- PAVED ROAD
- GRAVEL ROAD
- BICYCLE TRAIL
- EQUESTRIAN TRAIL



U.S.ARMY
CORPS OF
ENGINEERS

SCALE IN FEET
500 0 500 1000

$$-- THINK VALUE ENGINEERING --$$

Revisions

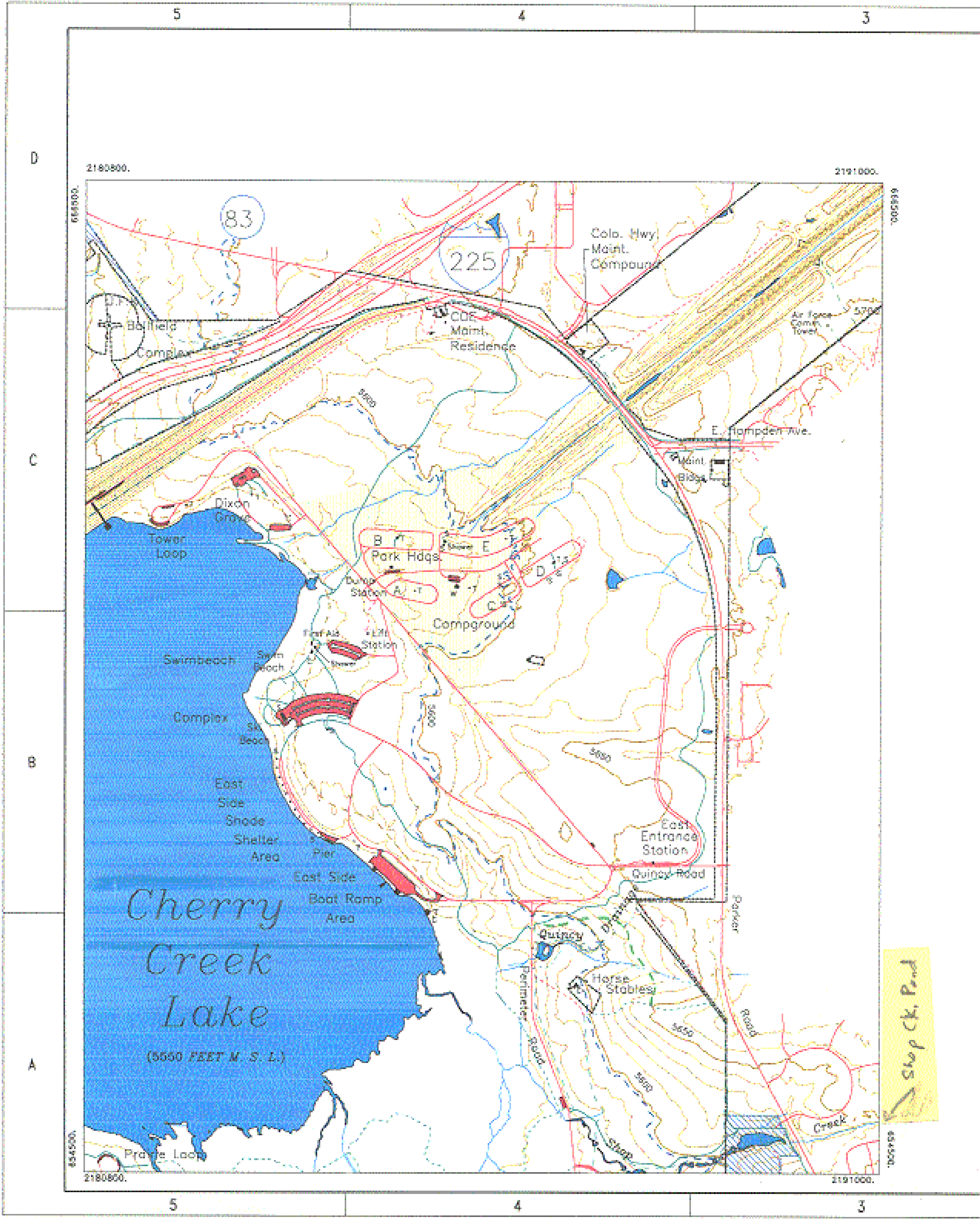
Symbol	Descriptions	Date	Approved

OMAHA DISTRICT GEOGRAPHIC INFORMATION SYSTEMS ENGINEERING DIVISION	U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA, NEBRASKA

CHERRY CREEK — COLORADO

CHERRY CREEK LAKE
MASTER PLAN
DEVELOPMENT PLAN
SHEET 2
PLATE 6

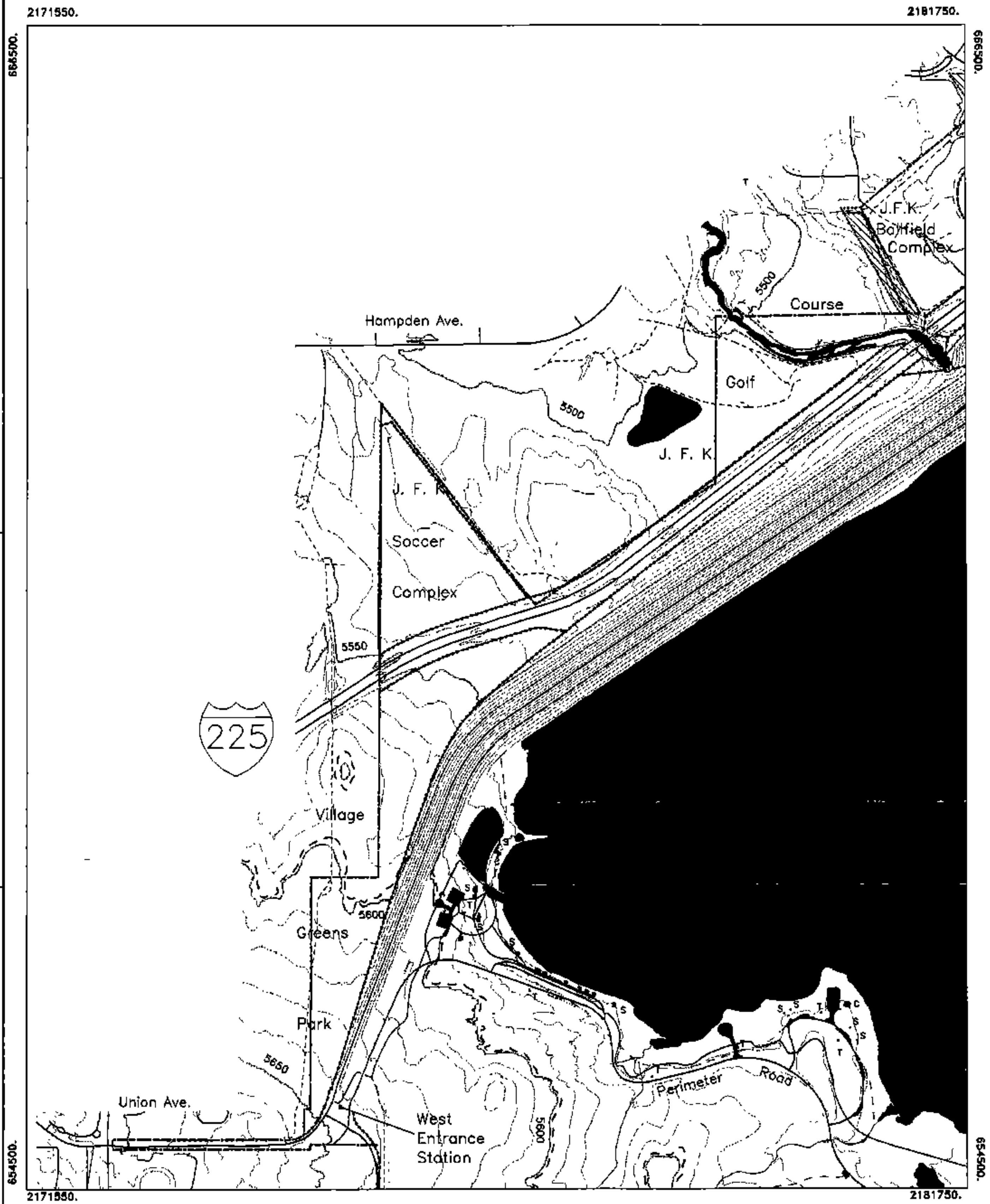
Designed by: CEMRO-ED-GIS			
Drawn by: Tom Rourke			
Checked by:			
Reviewed by: Elizabeth Peake	Scale: As Shown	Sheet reference number:	Date: 3-FEB-1992
Submitted by: RICHARD F. MINER PLANNING DIVISION	Design Memorandum: DM CC-14 Contract No.: DACW	2 OF 3	Drawing code: DCVDL-2

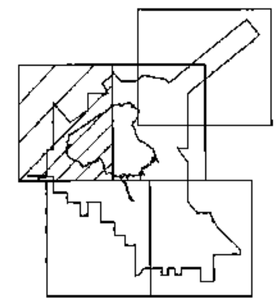


5
4
3
D
C
B
A
2180800.
2191000.
83
225
Colo. Hwy. Maint. Compound
Ballfield Complex
COE Maint. Residence
Air Force Comm. Tower
E. Hampden Ave.
Maint. Bldgs.
Dixon Grove
Tower Loop
Park Hdqs.
Dump Station
Campground
First Aid
Life Station
Swim Beach
Swimbeach Complex
East Side Shade Shelter Area
Pier
East Side Boat Ramp Area
East Entrance Station
Quincy Road
Quincy
Horse Stables
Perimeter Road
Parker Road
Creek
Cherry Creek Lake
(5550 FEET M. S. L.)
Prairie Loop
5600
5650
Shop Ck. Pond

MAP LEGEND

- WATER BODIES, STREAMS
- TOP OF FLOOD CONTROL POOL 5598 FEET M. S. L.
- PERMANENT EASEMENTS
- PROJECT BOUNDARY
- FENCE
- ELEVATION CONTOUR
- ULTIMATE EROSION LIMIT
- DAM EMBANKMENT AND SPILLWAY
- PARKING
- PAVED ROAD
- GRAVEL ROAD
- BICYCLE TRAIL
- EQUESTRIAN TRAIL





U.S.ARMY
CORPS OF
ENGINEERS

ED-GIS

SCALE IN FEET
500 0 500 1000

$$-- THINK VALUE ENGINEERING --$$

Revisions			
Symbol	Descriptions	Date	Approved

OMAHA DISTRICT GEOGRAPHIC INFORMATION SYSTEMS ENGINEERING DIVISION	U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA, NEBRASKA

Designed by: CEMRO-ED-GIS	CHERRY CREEK — COLORADO CHERRY CREEK LAKE MASTER PLAN DEVELOPMENT PLAN SHEET 3 PLATE 7		
Drawn by: Tim Rourke			
Checked by: Bill Schwening			
Reviewed by: Elizabeth Peake	Scale: As Shown	Sheet reference number:	Date: 3-FEB-1992
Submitted by: RICHARD P. MINER PLANNING DIVISION	Design Memorandum DM CC-14 Contract No.: DACW	3 OF 5	Drawing code: DEVEL-3

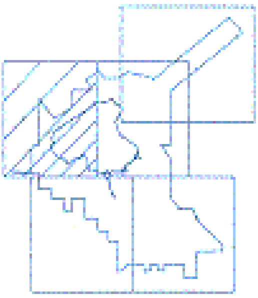
1

MAP LEGEND

- WATER BODIES, STREAMS
- TOP OF FLOOD CONTROL POOL 5598 FEET M. S. L.
- PERMANENT EASEMENTS
- PROJECT BOUNDARY
- FENCE
- ELEVATION CONTOUR
- ULTIMATE EROSION LIMIT
- DAM EMBANKMENT AND SPILLWAY
- PARKING
- PAVED ROAD
- GRAVEL ROAD
- BICYCLE TRAIL
- EQUESTRIAN TRAIL

D

C



B

U.S.ARMY
CORPS OF
ENGINEERS

SCALE IN FEET
500 0 500 1000

$$-- THINK VALUE ENGINEERING --$$

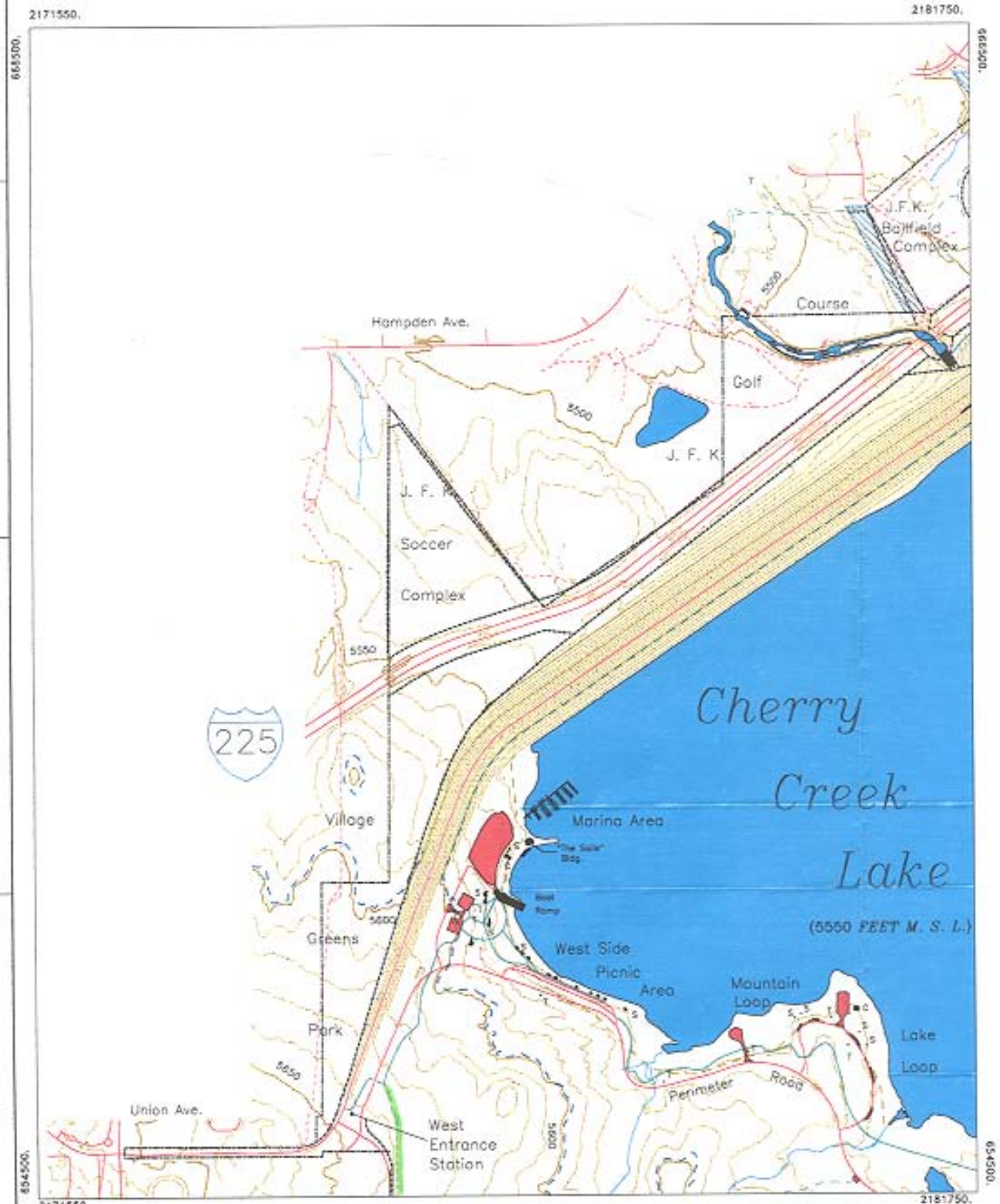
Revisions

Symbol	Descriptions	Date	Approved

OMAHA DISTRICT GEOGRAPHIC INFORMATION SYSTEMS ENGINEERING DIVISION	U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA, NEBRASKA

A

Designed by: CEMRO-ED-GIS	CHERRY CREEK ... COLORADO CHERRY CREEK LAKE MASTER PLAN DEVELOPMENT PLAN SHEET 3 PLATE 7		
Drawn by: Tim Rourke			
Checked by: Bill Schwering			
Reviewed by: Elizabeth Peple	Scale: As Shown	Sheet reference number:	Date: 3-FEB-1993
Submitted by: RICHARD P. MINER PLANNING DIVISION	Design Memorandum DM CC-14 Contract No.: DACW	5 OF 5	Drawing code: DEVEL-3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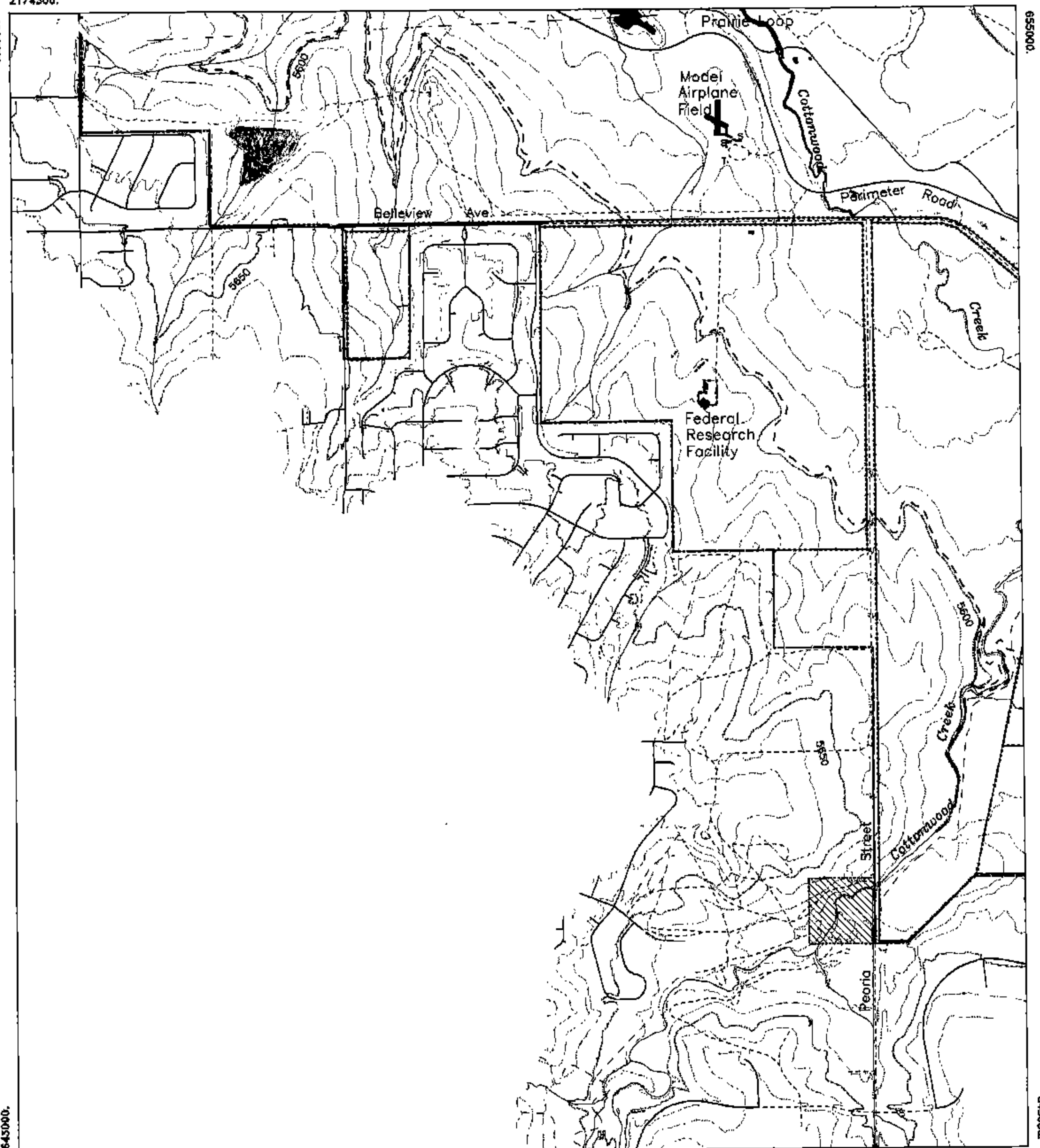
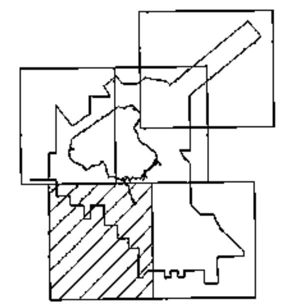
2181750.
668300.
654500.
J.F.K.
Ballfield
Complex
Course
Golf
Hampden Ave.
5500
J. F. K.
Soccer
Complex
5550
225
Village
Greens
5600
Park
5650
Union Ave.
West
Entrance
Station
Cherry
Creek
Lake
(5550 FEET M. S. L.)
Marina Area
"The Sailor"
Bldg.
Boat
Ramp
West Side
Picnic
Area
Mountain
Loop
Lake
Loop
Perimeter
Road



MAP LEGEND

- WATER BODIES, STREAMS
- TOP OF FLOOD CONTROL POOL 5598 FEET M. S. L.
- PERMANENT EASEMENTS
- PROJECT BOUNDARY
- FENCE
- ELEVATION CONTOUR
- ULTIMATE EROSION LIMIT
- DAM EMBANKMENT AND SPILLWAY
- PARKING
- PAVED ROAD
- GRAVEL ROAD
- BICYCLE TRAIL
- EQUESTRIAN TRAIL
- HIKING / NATURE TRAIL
- C CONCESSION BUILDING
- P PLAYGROUND
- S SHELTER HOUSE
- T TOILET
- W WASHHOUSE



U.S.ARMY CORPS OF ENGINEERS

ED-GIS

SCALE IN FEET
500 0 500 1000

$$-- THINK VALUE ENGINEERING --$$

Revisions			
Symbol	Descriptions	Date	Approved

OMAHA DISTRICT
GEOGRAPHIC INFORMATION SYSTEMS
ENGINEERING DIVISION

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

CHERRY CREEK — COLORADO

CHERRY CREEK LAKE MASTER PLAN DEVELOPMENT PLAN SHEET 4 PLATE 8

Designed by: CEMRO-ED-GIS
Drawn by: Tim Rourke
Checked by: Bill Schwening
Reviewed by: Elizabeth Peake
Submitted by: RICHARD F. MINER PLANNING DIVISION

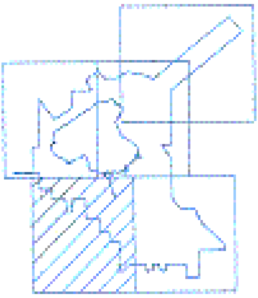
Scale: As Shown
Design Memorandum DM CC-14
Contract No.: DACW
Sheet reference number: 4 OF 5
Date: 3-FEB-1992
Drawing code: DEVEL-4

1

MAP LEGEND

(blue fill)	WATER BODIES, STREAMS
(blue dashed line)	TOP OF FLOOD CONTROL POOL 5646 FEET M. S. L.
(hatched box)	PERMANENT EASEMENTS
(line)	PROJECT BOUNDARY
(line)	FENCE
(line)	ELEVATION CONTOUR
(dashed line)	ULTIMATE EROSION LIMIT
(yellow box)	DAM EMBANKMENT AND SPILLWAY
(red fill)	PARKING
(line)	PAVED ROAD
(dashed line)	GRAVEL ROAD
(line)	BICYCLE TRAIL
(dashed line)	EQUESTRIAN TRAIL
(dotted line)	HIKING / NATURE TRAIL
C	CONCESSION BUILDING
P	PLAYGROUND
S	SHELTER HOUSE
T	TOILET
W	WASHHOUSE

[illegible]



D

C

B

A

U.S.ARMY
CORPS OF
ENGINEERS

SCALE IN FEET
500 0 500 1000

$$-- THINK VALUE ENGINEERING --$$

Revisions			
Symbol	Description	Date	Approved

OMAHA DISTRICT
GEOGRAPHIC INFORMATION SYSTEMS
ENGINEERING DIVISION

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

Designed by: CEMRO-ED-GIS

Drawn by: Tim Rourke

Checked by: Bill Schwering

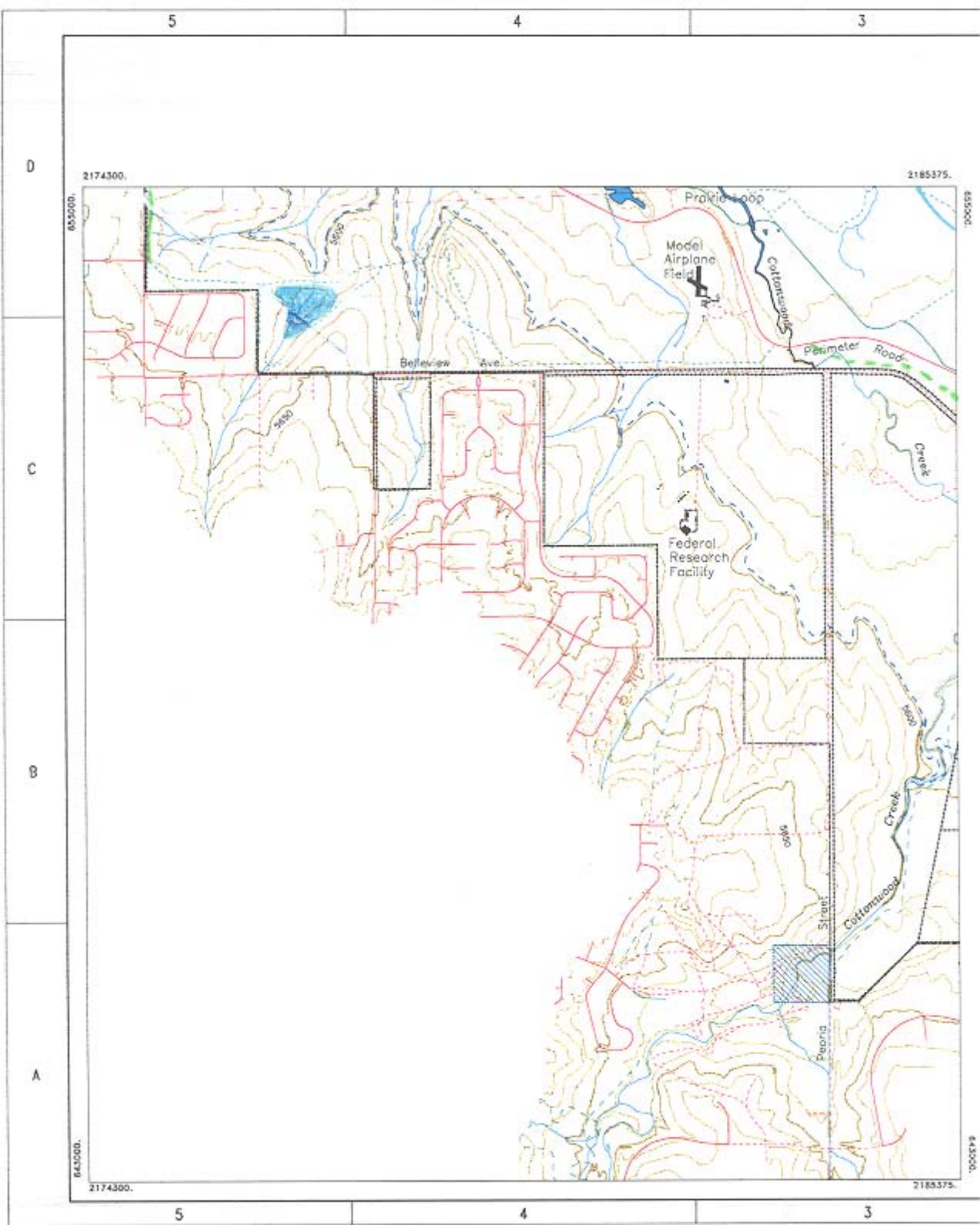
Reviewed by: Elizabeth Peake

Submitted by: RICHARD P. WINER, PLANNING DIVISION

CHERRY CREEK — COLORADO

CHERRY CREEK LAKE
MASTER PLAN
DEVELOPMENT PLAN
SHEET 4
PLATE 8

Scale: As Shown	Sheet reference number	Date: 3-FEB-1992
Design Memorandum DM CC-14		Drawing code:
Contract No.: DACW	4 OF 8	DEVEL-4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4
3
D
C
B
A
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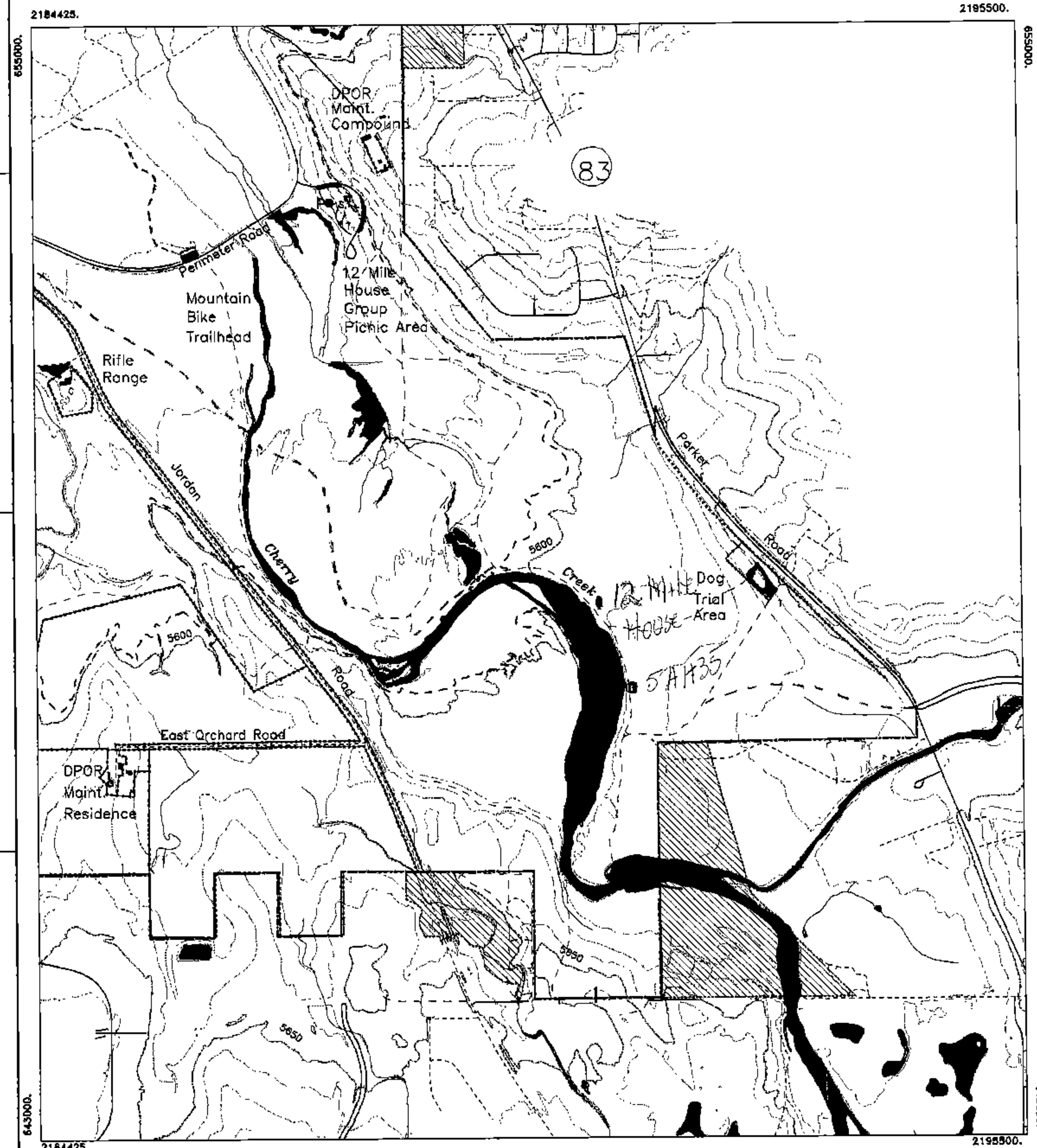
2185375.
655000.
643000.
Model
Airplane
Field
Perimeter Road
Bellview Ave.
Federal
Research
Facility
Cottonwood Creek
Peoria Street
3650



MAP LEGEND

- WATER BODIES, STREAMS
- TOP OF FLOOD CONTROL POOL 5598 FEET M. S. L.
- PERMANENT EASEMENTS
- PROJECT BOUNDARY
- FENCE
- ELEVATION CONTOUR
- ULTIMATE EROSION LIMIT
- DAM EMBANKMENT AND SPILLWAY
- PARKING
- PAVED ROAD
- GRAVEL ROAD
- BICYCLE TRAIL
- EQUESTRIAN TRAIL
- HIKING / NATURE TRAIL
- C CONCESSION BUILDING
- P PLAYGROUND
- S SHELTER HOUSE
- T TOILET
- W WASHHOUSE

U.S.ARMY CORPS OF ENGINEERS

SCALE IN FEET 500 0 500 1000

$$-- THINK VALUE ENGINEERING --$$

Revisions			
Symbol	Descriptions	Date	Approved

OMAHA DISTRICT
GEOGRAPHIC INFORMATION SYSTEMS
ENGINEERING DIVISION

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

CHERRY CREEK — COLORADO

CHERRY CREEK LAKE MASTER PLAN DEVELOPMENT PLAN SHEET 5 PLATE 9

Designed by: CEMRO-ED-GIS
Drawn by: Tim Rourke
Checked by: Bill Schwening
Reviewed by: Elizabeth Peake
Submitted by: RICHARD P. MINER PLANNING DIVISION
Scale: As Shown
Design Memorandum DM CC-14
Contract No.: DACW
Sheet reference number: 5 OF 9
Date: 3-FEB-1992
Drawing code: DEVEL-5

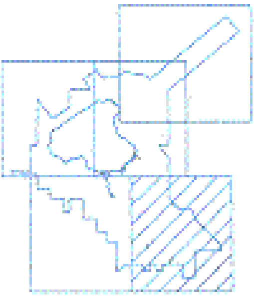
MAP LEGEND

Symbol	Description
	WATER BODIES, STREAMS
	TOP OF FLOOD CONTROL POOL 5598 FEET M. S. L.
	PERMANENT EASEMENTS
	PROJECT BOUNDARY
	FENCE
	ELEVATION CONTOUR
	ULTIMATE EROSION LIMIT
	DAM EMBANKMENT AND SPILLWAY
	PARKING
	PAVED ROAD
	GRAVEL ROAD
	BICYCLE TRAIL
	EQUESTRIAN TRAIL
	HIKING / NATURE TRAIL
C	CONCESSION BUILDING
P	PLAYGROUND
S	SHELTER HOUSE
T	TOILET
W	WASHHOUSE

D

C

NOTE: This map compiled from the Omaha District Cherry Creek [illegible]



B

U.S.ARMY
CORPS OF
ENGINEERS

SCALE IN FEET
500 0 500 1000

$$-- THINK VALUE ENGINEERING --$$

Revisions

Symbol	Descriptions	Date	Approved

OMAHA DISTRICT
GEOGRAPHIC INFORMATION SYSTEMS
ENGINEERING DIVISION

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

A

Designed by: CENWO-ED-GIS

Drawn by: Tim Bourke

Checked by: Bill Schwenning

Reviewed by: Elizabeth Peake

Submitted by: RICHARD F. MINER, PLANNING DIVISION

CHERRY CREEK — COLORADO

CHERRY CREEK LAKE
MASTER PLAN
DEVELOPMENT PLAN
SHEET 5
PLATE 9

Scale: As Shown

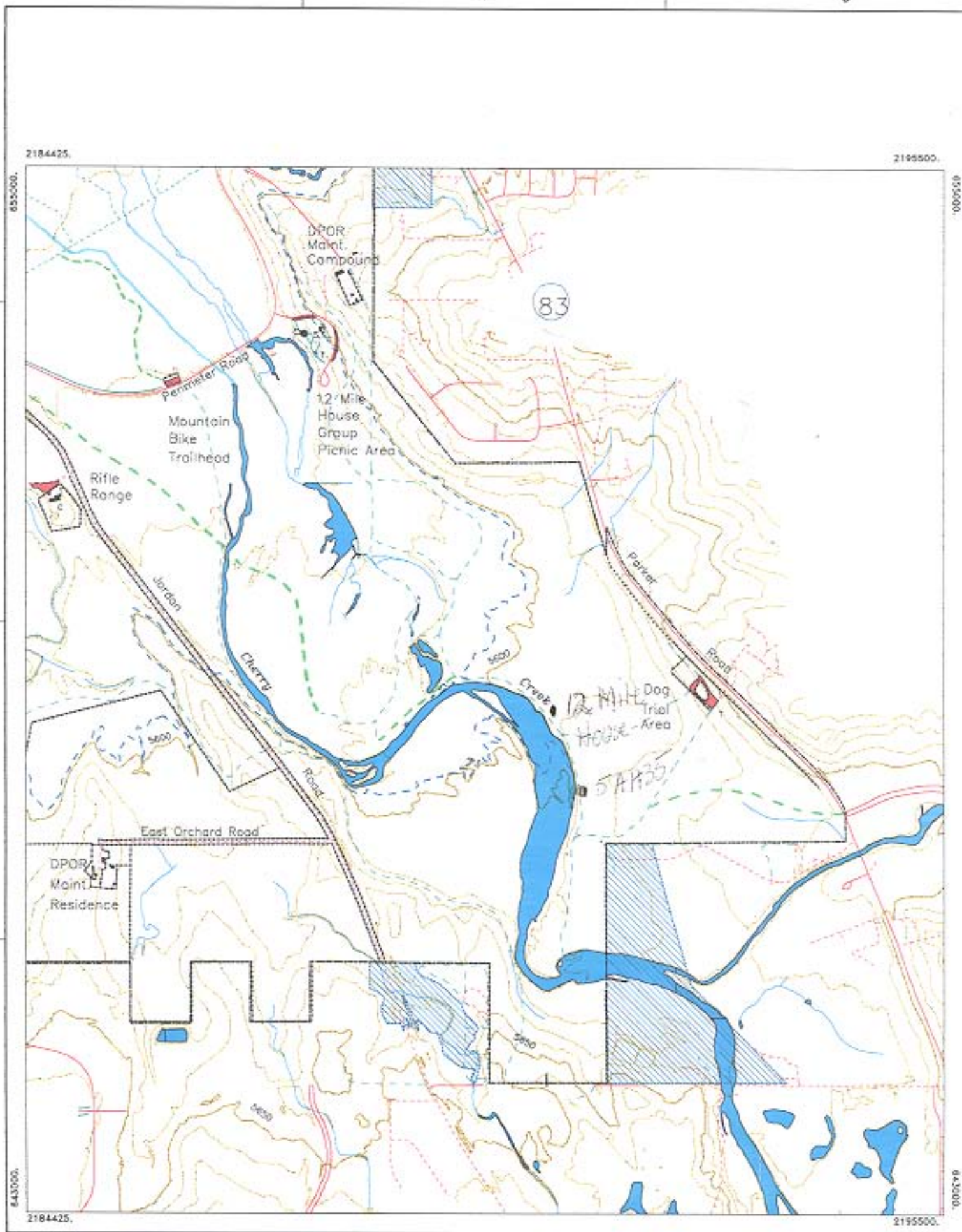
Design Memorandum: DM CC-14

Contract No.: DACW

Sheet reference number: 5 OF 5

Date: 3-FEB-1992

Drawing code: CEVTL-5


5
4
3
D
C
B
A
2184425.
2195500.
655000.
643000.
DPOR
Maint.
Compound
83
Perimeter Road
1.2 Mile
House
Group
Picnic Area
Mountain
Bike
Trailhead
Rifle
Range
Jordan
Cherry
Creek
Parker
Road
12 Mile
House
Dog
Trial
Area
5AM30
East Orchard Road
DPOR
Maint
Residence
5600
5650

U.S.ARMY
CORPS OF
ENGINEERS

SCALE IN MILES
0 1 2 3 4 6

$$-- THINK VALUE ENGINEERING --$$

Revisions

Symbol	Descriptions	Date	Approved

OMAHA DISTRICT
GEOGRAPHIC INFORMATION SYSTEMS
ENGINEERING DIVISION

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

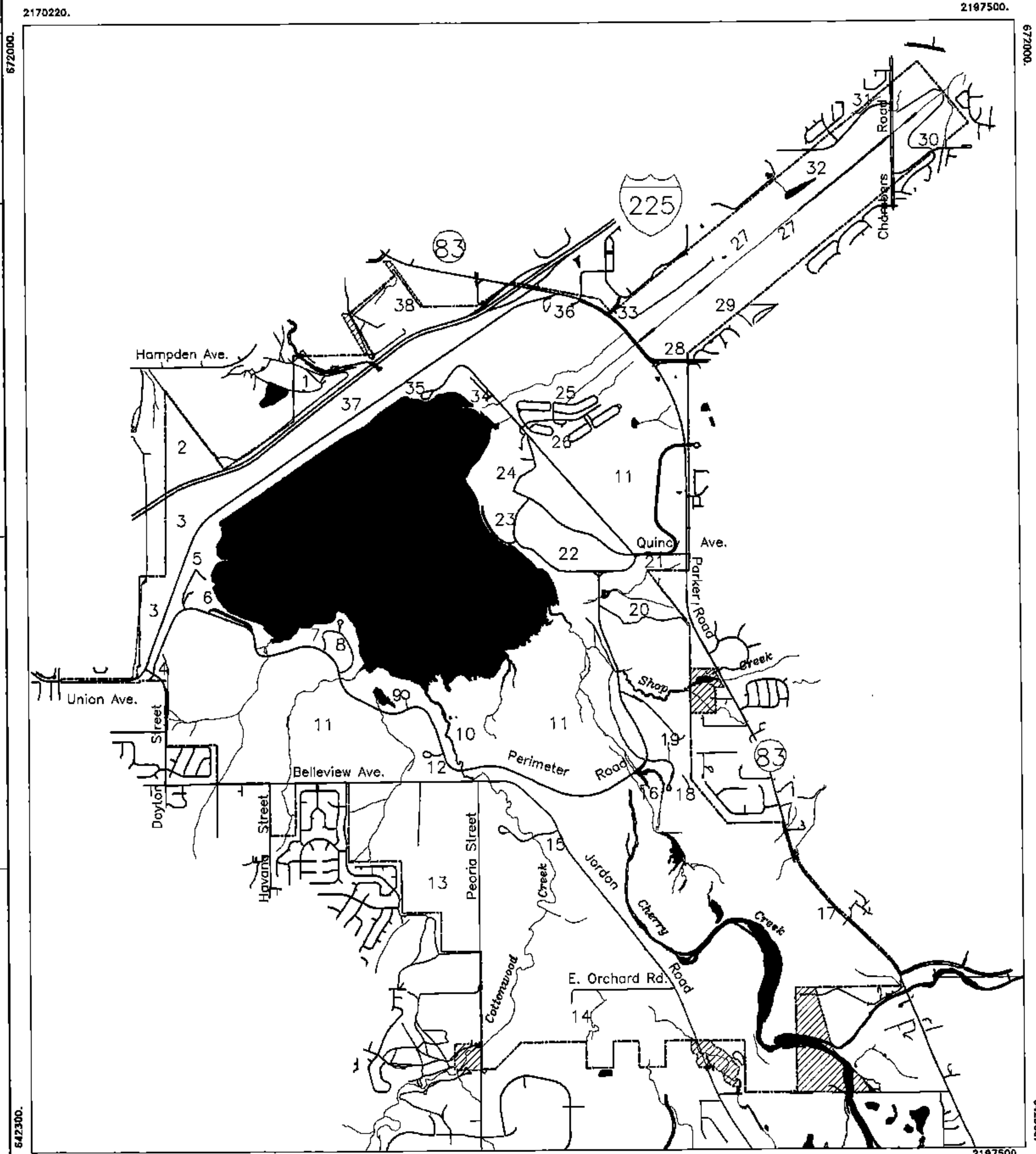
Designed by: CEMRC-ED-DIS
Drawn by:
Checked by:
Reviewed by: Elizabeth Peake
Submitted by: RICHARD P. VINER PLANNING DIVISION

CHERRY CREEK — COLORADO

CHERRY CREEK LAKE
MASTER PLAN
AERIAL PHOTOGRAPH

PLATE 10

Scale: As Shown
Design Memorandum No. CC-14
Contract No.: DACW
Sheet reference number:
Date: 12-NOV-1991
Drawing code: AERIAL-1



MAP LEGEND

1 – J.F. KENNEDY GOLF COURSE
2 – J.F. KENNEDY SOCCER COMPLEX
3 – VILLAGE GREENS PARK
4 – WEST ENTRANCE STATION
5 – MARINA AREA
6 – WEST SIDE PICNIC AREA
7 – MOUNTAIN LOOP
8 – LAKE LOOP
9 – PRAIRIE LOOP
10 – NATURE TRAIL AREA
11 – SRA OPEN SPACE
12 – MODEL AIRPLANE FIELD
13 – FEDERAL RESEARCH FACILITY
14 – DPOR MAINT. RESIDENCE
15 – RIFLE RANGE
16 – MOUNTAIN BIKE TRAILHEAD
17 – DOG TRIAL AREA
18 – 12 MI. HOUSE GR. PICNIC AREA
19 – DPOR MAINT. COMPOUND
20 – HORSE STABLES
21 – EAST ENTRANCE STATION
22 – EAST SIDE BOAT RAMP AREA
23 – EAST SIDE SHADE SHELTER AREA
24 – SWIMBEACH COMPLEX
25 – CAMPGROUND
26 – DPOR PARK HEADQUARTERS
27 – SPILLWAY CHANNEL
28 – SOUTH SPILLWAY AREA
29 – AIR FORCE COMM. TOWER
30 – OLYMPIC PARK
31 – CRESTRIDGE PARK
32 – NORTH SPILLWAY AREA
33 – COLO. HWY. MAINT. COMPOUND
34 – DIXON GROVE
35 – TOWER LOOP
36 – C.O.E. MAINT. RESIDENCE
37 – DAM, INTAKE AND OUTLET
38 – J.F.K. BALLFIELD COMPLEX

NOTE: This map compiled from the Omaha District Cherry Creek [illegible]

U.S. ARMY CORPS OF ENGINEERS

ED-GIS

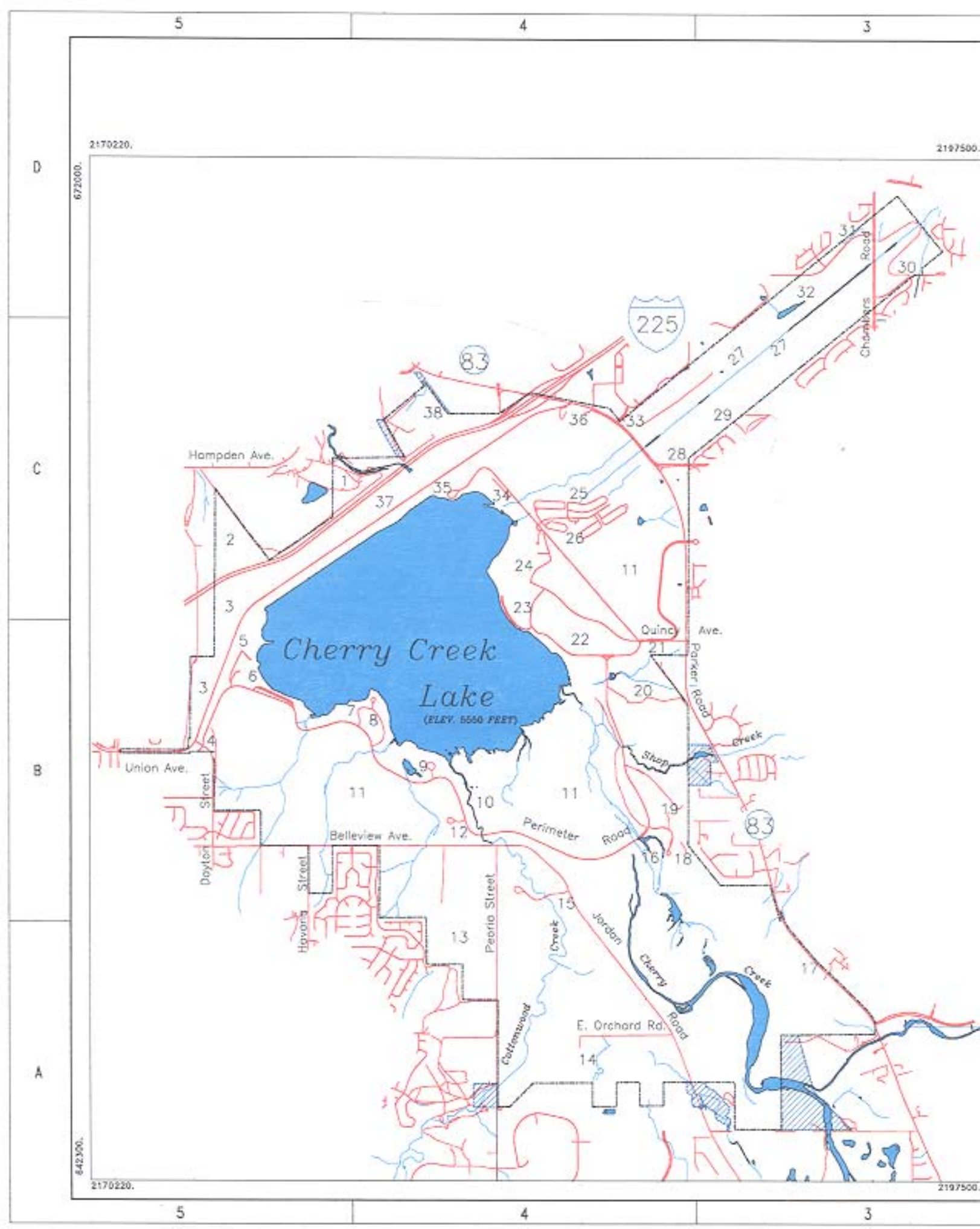
SCALE IN FEET
1200 0 1200 2400

$$-- THINK VALUE ENGINEERING --$$

Revisions			
Symbol	Descriptions	Date	Approved

OMAHA DISTRICT GEOGRAPHIC INFORMATION SYSTEMS ENGINEERING DIVISION	U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS OMAHA, NEBRASKA

Designed by: CEMRO-ED-GIS	CHERRY CREEK — COLORADO CHERRY CREEK LAKE MASTER PLAN FACILITY LOCATIONS PLATE 11		
Drawn by: Tim Rourke			
Checked by: Bill Schwening			
Reviewed by: Elizabeth Peake	Scale: As Shown	Sheet reference number:	Date: 20-JAN-1993
Submitted by: RICHARD P. MINER PLANNING DIVISION	Design Memorandum DM 00-14 Contract No.: DACW		Drawing code: FACLOC-8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4
3
D
C
B
A
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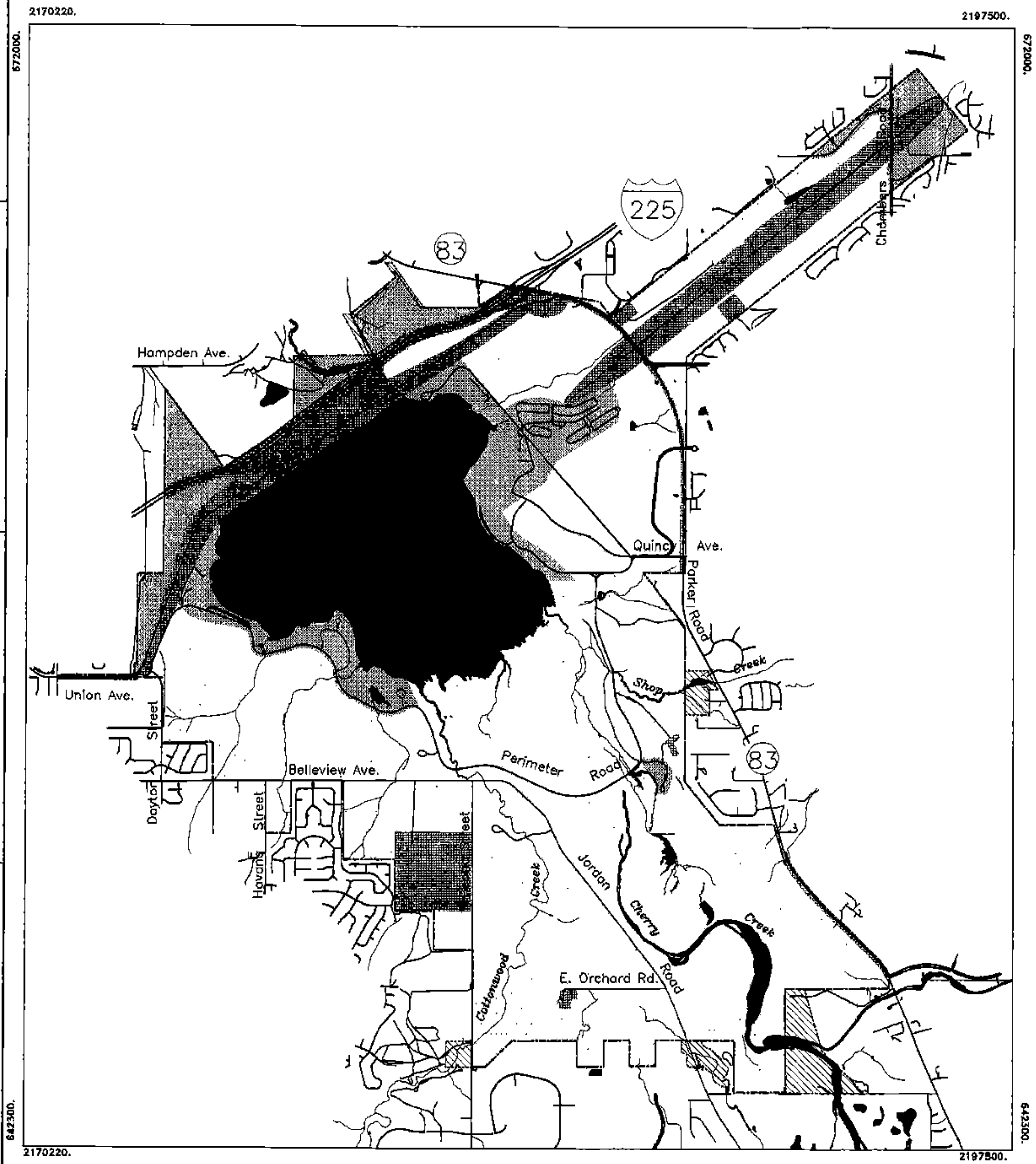
2197500.
672000.
842300.
Cherry Creek
Lake
(ELEV. 5560 FEET)
225
83
Hampden Ave.
Union Ave.
Belleview Ave.
Quincy Ave.
Parker Road
Perimeter Road
E. Orchard Rd.
Dayton Street
Havana Street
Peoria Street
Chambers Road
Cottonwood Creek
Jordan Creek
Cherry Creek
Stop Creek



MAP LEGEND

- PROJECT OPERATIONS
- RECREATION
- MULTIPLE RESOURCE MGMT.
- PERMANENT EASEMENTS
- PROJECT BOUNDARY
- WATER BODIES, STREAMS
- TRANSPORTATION

U.S.ARMY CORPS OF ENGINEERS

ED-GIS

SCALE IN FEET
1200 0 1200 2400

$$-- THINK VALUE ENGINEERING --$$

Revisions			
Symbol	Descriptions	Date	Approved

OMAHA DISTRICT
GEOGRAPHIC INFORMATION SYSTEMS
ENGINEERING DIVISION

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

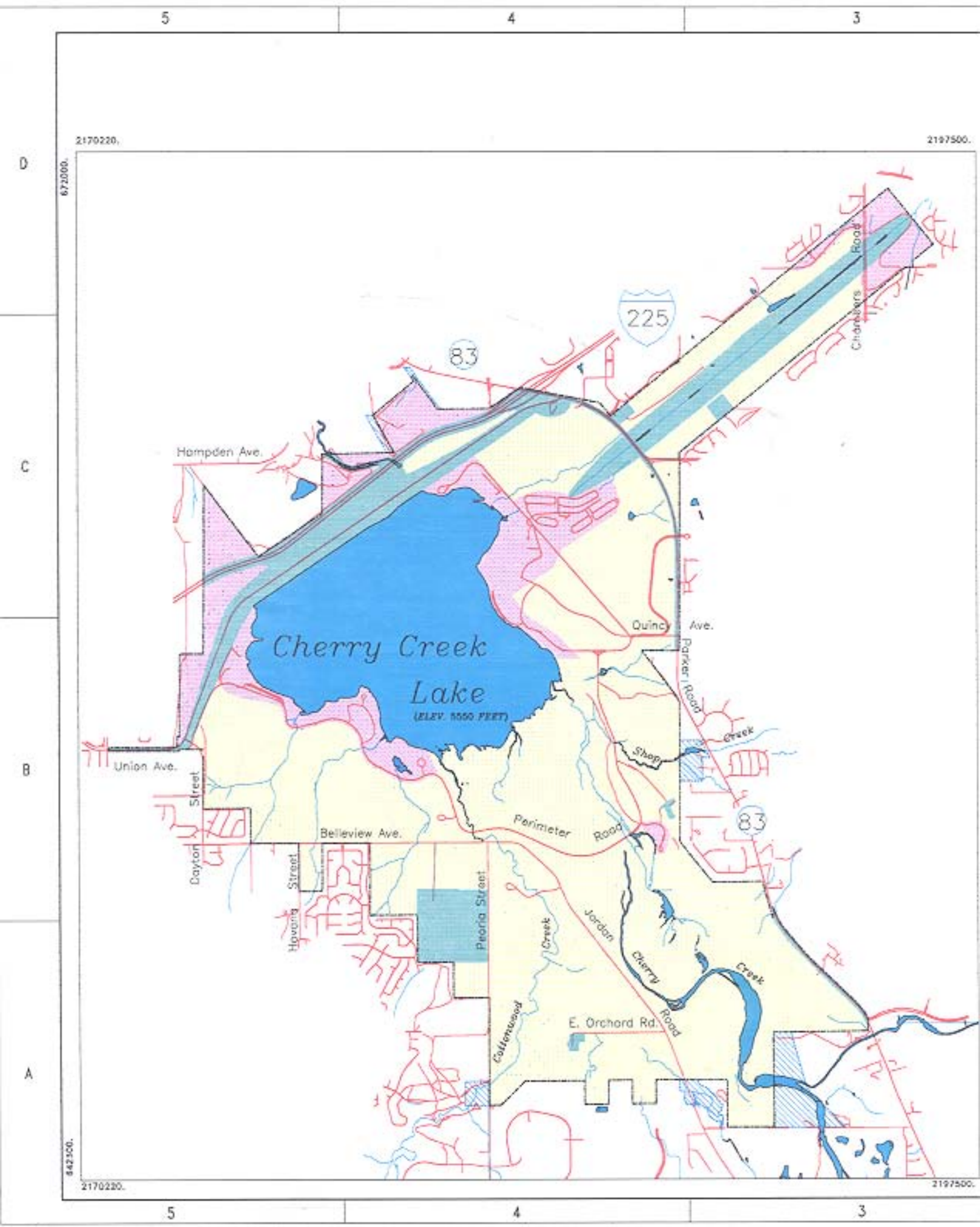
Designed by: CEMRO-ED-GIS
Drawn by: Tim Rourke
Checked by: Bill Schwening
Reviewed by: Elizabeth Peake
Submitted by: RICHARD P. MINER, PLANNING DIVISION

CHERRY CREEK — COLORADO

CHERRY CREEK LAKE MASTER PLAN LAND CLASSIFICATIONS

PLATE 12

Scale: As Shown
Design Memorandum: DM CC-14
Contract No.: DACW
Sheet reference number:
Date: 20-JAN-1992
Drawing code: LANDC-1


5
4
3
D
C
B
A
2170220.
2197500.
672000.
842300.
225
83
Hampden Ave.
Cherry Creek
Lake
(ELEV. 5550 FEET)
Quincy Ave.
Parker Road
Chambers Road
Union Ave.
Dayton Street
Belleview Ave.
Havana Street
Peoria Street
Perimeter Road
Shop Creek
Jordan Creek
Cherry Creek
Cottonwood
E. Orchard Rd.